SCIENTIFIC AMERICAN

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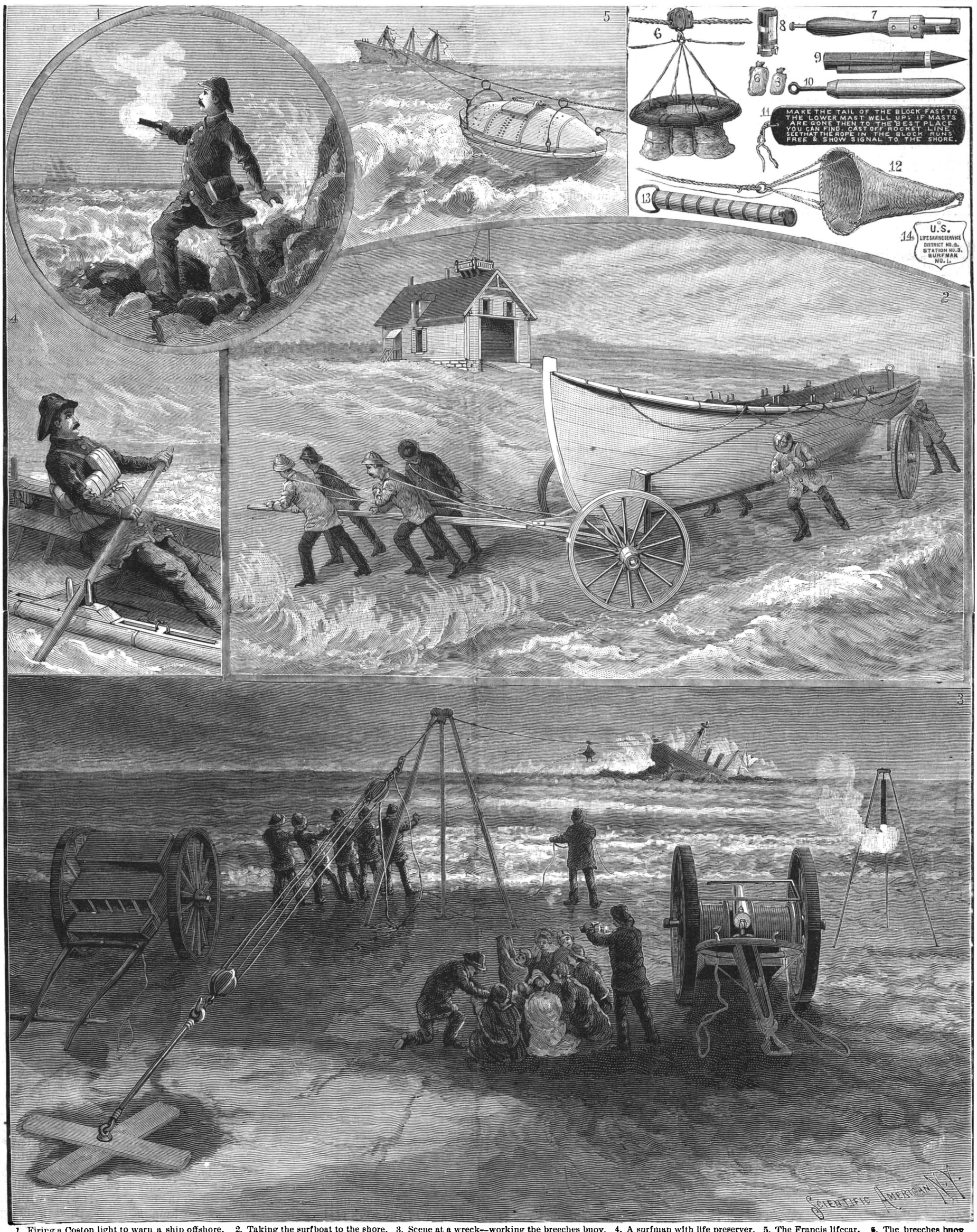
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U.S. LIFE SAVING SERVICE DISTRICT NO. 5. STATION NO. 3. SURFMAN NO. 1.
SCIENTIFIC AMERICAN N.Y.

1. Firing a Coston light to warn a ship offshore. 2. Taking the surfboat to the shore. 3. Scene at a wreck—working the breeches buoy. 4. A surfman with life preserver. 5. The Francis lifecar. 6. The breeches buoy. 7. Coston light with handle. 8. Coston light detached from handle. 9. Rocket head. 10. Shot for gun, with 6 and 8 oz. powder cartridges. 11. Direction board as attached to whip-line block. 12. Canvas drag. 13. Light for use at wrecks. 14. Patrol check.

THE UNITED STATES LIFE SAVING SERVICE.—[See page 117.]

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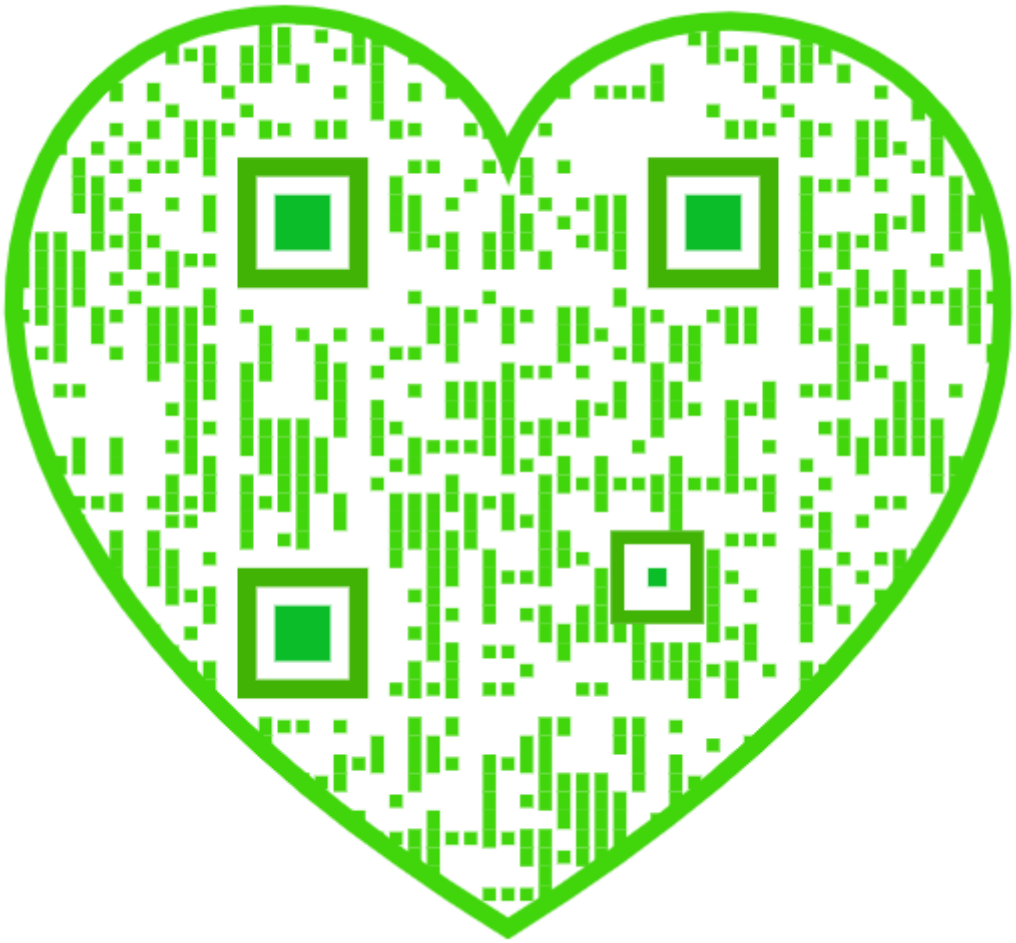

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NEW YORK, SATURDAY, FEBRUARY 21, 1891.

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PATENT OFFICE REPORT FOR 1890.

The Commissioner of Patents is required to make two reports annually, one in the middle of the year, to the Secretary of the Interior, and one at the close of the year, to Congress.

The annual report to Congress for the year ending Dec. 31, 1890, has lately been presented, from which it appears that the business of the Patent Office has been well maintained. In 1890 the number of applications for patents made was 41,048, an increase of 500 over the previous year. The number of patents issued for 1890 was 26,292.

The State of New York takes the lead in respect to number of patents, 4,585 having been issued to her citizens, 2,641 to Pennsylvania, 2,153 to Illinois, 2,096 to Massachusetts, 1,762 to Ohio, 1,112 to New Jersey; Mississippi, 55.

In respect to patents and population, Connecticut takes the lead, one patent having been granted to 796 of population; District of Columbia, 1 to 980; Massachusetts, 1 to 1,068; New York, 1 to 1,308; Mississippi, 1 to 23,447.

The receipts of the Patent Office for 1890 were $1,340,372, and the expenses $1,099,297, leaving an excess of receipts over expenditures of $241,074.

The total balance to the credit of the patent fund now in the Treasury is $3,872,745.

Commissioner Mitchell in his report says:

"The first need of the Patent Office is additional room. During the past year the utmost effort and ingenuity have been rendered necessary in order to find space even for copies of patents as they have been produced from week to week. The income from these copies during the past year has been upward of $60,000. They have been stored in various parts of the building, upon different floors, in different halls and corridors, and only by the most careful systemization is a searcher, however experienced, enabled to know in what hall, corridor, or cranny he must look in order to find a particular patent. During the past year the office has been compelled to appropriate to other uses one of the rooms occupied by inventors and their attorneys for the purpose of inspecting their pending applications, and the consequence is that the remaining room, which has only 23 feet square of floor space, is overcrowded and every day occupied by more than thirty persons at a time. An effort is now being made to restore to the inventors and their attorneys the use of the other room formerly occupied by them. This will be accomplished, if at all, by walling off a space in the already crowded model halls. The Scientific Library, containing about 60,000 volumes, is crowded into disconnected rooms and galleries, appropriated from one of the model halls. The rooms of the examining divisions are overcrowded; some of them are unhealthy at best; others are rendered unhealthy by their crowded condition. From all parts of the office arises a daily demand for additional room, which cannot be supplied, but which must, nevertheless, be supplied if the Patent Office is to do its work at all. It is nearly ten years since my predecessors directed attention to this imperative need. Not a report has been made to Congress during the intervening decade which did not dwell upon the necessity for additional room, and with increasing emphasis from year to year. Meanwhile the amount of work annually transacted has nearly doubled; meanwhile the records and copies have vastly accumulated; meanwhile the number of rooms and the extent of space occupied by the Patent Office have become gradually less and less. During the last six years the patrons of the Patent Office have paid into the Treasury over a million of dollars in excess of every expenditure of every kind, either by the Patent Office or by the Department of the Interior for the benefit of the Patent Office. The net income of the present year is greater than it was during the year before. Last year it was greater than during the prior year. The inventors of the country cannot understand why their money is taken while adequate facilities are denied. The policy of making the Patent Office a permanent source of revenue—a bureau of taxation for the general purposes of the government—has never been advocated, so far as I know, by any one. The time will soon arrive when it will be impossible to discharge the functions of this bureau unless some provision is made to afford relief for its overcrowded condition; and I earnestly request that that relief may be afforded."

The circulation of the *Official Gazette* is 7,000 copies per week, of which 3,576 copies are given away to members of Congress and other public officers, balance sold at $5 a year. The cost of the *Gazette* is $61,439, or about $44,000 a year more than is received, nearly all of which comes out of the inventors.

The Commissioner strongly urges upon Congress the necessity for an increased force in order to facilitate and perfect the system of official examinations. He calls attention to the inadequacy of the present salaries paid to examiners, and urges a reasonable increase. He recommends a resumption of the work of making an abridgment of all patents, as it would greatly facilitate the work of examination, and enable inventors and their attorneys to make their own examinations.

The laws relating to the date of patents, respecting trade marks, limitation of patents, interference proceedings, need, in the opinion of the Commissioner, to be modified. The report, taken as a whole, is a most able and interesting document.

IMPROVEMENT NEEDED IN SECONDARY BATTERIES.

The late Gaston Planté, the originator of the first practical secondary battery, was in some respects like Faraday.

He prosecuted his scientific investigations for the love of science and for the benefit his labors might confer in the future on science and the arts, rather than from any immediate pecuniary benefit he might derive from his work.

The invention of the Planté secondary element bears much the same relation to recent secondary batteries that Faraday's discoveries in induction bear to the dynamo. Both are fundamental, and of great scientific and commercial importance, and both are represented by a host of modern inventions, but it is after all a question whether the highest perfection has been attained in these lines, notwithstanding years of development. Cannot recent results, as wonderful as they appear, be surpassed? We believe they can. In secondary batteries, for example, there are at least three chances for improvement, viz., in efficiency, in durability, and in the matter of weight.

The efficiency of the secondary battery, as compared with alternate transformers, is as 0·72 to 0·94. In point of durability, improvement is much needed. The question of weight is of little importance in a stationary plant, except in so far as it contributes to cost; but in portable batteries, undue weight becomes a serious drawback.

The weight per horse power hour of the Planté battery is 396 pounds; that of the Faure, according to Sir W. Thomson, is 165 pounds; while that of the E. P. S. battery is about 135 pounds. What is wanted is a lighter, more durable, and more efficient element. It is not likely that marked improvement can be made without patient, well directed effort, but we know of no field of invention more promising than that to which we refer.

The endeavor of the investigator in this line should be to inaugurate a new departure. This, we know, is easier said than done. It involves discovery rather than invention, which means months and possibly years of careful searching and experiment; but the prospective reward warrants patient and intelligent labor.

Detecting Olive Oil, Butter and Oleomargarine.

The reagent employed is a solution of silver nitrate at 25 per 1,000 in ethylic alcohol at 95°. About 12 c.c. of the oil in question and 5 c.c. of the reagent are placed in a test-tube. The tube is then set in a beaker of boiling water, and the changes of color which take place in the liquids are watched through the glass. Unless the oils are perfectly limpid, they must be previously filtered. Olive oils sooner or later take a fine green color, which is lighter in the superior qualities. Pure cotton-seed oil is turned completely black. Oil of earth nuts (*Arachis*) takes first a red-brown color and finally turns green, losing its transparency. Oil of sesame takes a deep red color and remains reddish. Oil of colza takes yellowish green colors and becomes turbid. Natural butter preserves its natural color. Oleomargarine becomes a brick red, which color may be detected even in samples containing as little as 5 per cent of margarine.—*Raoul Brulle.*

THE number of retail liquor dealers in the United States, according to the official returns of the officers of the internal revenue for the year ending May 1, 1890, was 185,868, or 1 liquor dealer to every 275 inhabitants, on the basis of the census of 1880. In New York there was 1 retail dealer in distilled liquors to every 150 inhabitants; in New Jersey, 1 to 175; in Ohio, 1 to 230; in Pennsylvania and Massachusetts, 1 to 400; in Indiana, 1 to 325; in Delaware, 1 to 160; and in California, 1 to 75. The average in all the States which have general license laws is 1 dram shop to 250 inhabitants. In Maine there is 1 retail dealer in distilled liquors to every 750 inhabitants; in Vermont, 1 to 820; in Iowa, 1 to 520; and in Kansas, 1 to 800.

THE director of the central dispensary at Bagdad has sent to *La Nature* a specimen of an edible substance which fell during an abundant shower in the neighborhood of Merdin and Diarbekir (Turkey in Asia) in August, 1890. The rain which accompanied the substance fell over a surface of about ten kilometers in circumference. The inhabitants collected the "manna," and made it into bread, which is said to have been very good and to have been easily digested. The specimen sent to *La Nature* is composed of small spherules. Yellowish on the outside, it is white within. Botanists who have examined it say that it belongs to the family of lichens known as *Lecanora esculenta.*

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Detection of Flaws in Metal.

An instrument for detecting flaws in metal castings and forgings, which is called the schiseophone, has been invented by Captain De Place, of Paris. The apparatus, says the London *Times*, consists of a small pneumatic tapper worked by the hand, and with which the piece of steel or iron to be tested is tapped all over. Connected with the tapper is a telephone, with a microphone interposed in the circuit. Two operators are required—one to apply the tapper, and the other to listen through the telephone to the sounds produced. These operators are in separate apartments, so that the direct sounds of the taps may not disturb the listener, whose province it is to detect flaws. The two, however, are in electrical communication; so that the instant the listener hears a false sound, he can signal to his colleague to mark the metal at the point of the last tap. In practice, the listener sits with the telephone to his ear; and so long as the taps are normal, he does nothing. Directly a false sound—which is very distinct from the normal sound—is heard, he at once signals for the spot to be marked. By this means he is able not only to detect a flaw, but to localize it. Under the auspices of the Southeastern Railway Company, a demonstration of the sch seophone was given recently by Captain De Place at the Charing Cross Hotel, in the presence of several members of the Ordnance Committee and other government officials. Some samples of steel, wrought iron, and cast iron, which had been specially prepared and privately marked, were tested, and in many cases the flaws therein were correctly localized by the instrument. On the other hand, some bars were broken at points where a flaw was indicated, but where the metal proved perfectly sound. Consequently, however ingenious the invention may be, it can hardly yet be called a practical success.

Trees and Shrubs in Grass.

The inquiry is made for the treatment of trees and shrubs growing in a smooth lawn, so as to retain their richness and vigor, the well known retarding influence of a dense grass surface tending to give them a feeble and stunted appearance, with moss on their stems. The two leading remedies are fertilizers and a free natural or inherently strong growth. By the selection of the most vigorous growers, we may overcome partly the natural difficulty, which will apply to shade trees as well as the larger shrubs. The smaller shrubs will need, at least in their earlier years, a mellow and rich soil, and if set in small groups or beds, the grass ground in which they stand should be a circular or elliptical bed, kept clean and mellow and occasionally enriched with the application of such fertilizers as experience has proved best adapted to that locality. These beds should be simple and unobtrusive in their form, the ornament consisting in the fine growths which they contain. Arabesque beds, or those of fanciful shape, are only adapted to low-growing bulbous plants, or to annuals or herbaceous perennials which will not hide the outline. There are, however, many strong-growing perennials which will maintain their vigor entirely in grass, after a few years of cultivation. It is better to have fewer plants under the best care and in the best condition than a promiscuous assemblage which is crowded and stunted.

The check which is given to young trees by standing in grass will vary much with the condition of the grass. A tall and dense crop of timothy and clover will generally be too much for even strong trees of younger growth, sometimes destroying newly set ones. A meadow is not the place to set young trees. A sheep pasture is much better, the trees being shielded from their attacks. If kept always grazed short, the condition is still better. The want of the rank foliage checks the roots, and there is a shorter growth of them. Hence the reason that a closely shaven lawn is a better place for trees. When the lawn is top-dressed annually with a suitable fertilizer, it is in every way a more favorable place than a dense meadow, or even a rich pasture, care also being taken to let the clippings of the lawn mower fall to the ground where they are cut. The natural dressing of the falling leaves may be superseded by the annual application of the fertilizers at the same season of the year. It is important to let the clippings remain, as they aid in preserving the moisture of the soil, which otherwise might be dissipated by the heat of the sun's rays.

As a general rule for treatment, therefore, plant no trees in a meadow, nor in ground of a similar character. Strong growers may do in a grazed pasture, if shielded from the animals, and if mulched broadly while young. Finished lawns are still better if annually top-dressed, and the clippings from the weekly mowings remain on the ground. Best of all is a clean, mellow, cultivated surface, wide enough for a free extension of the roots. Large trees strike their roots deeper, and may do in heavy grass.

The fertilizers which may be used will vary with the condition or character of the soil. Bone ash has a great effect on some soils only; nitrate of soda on others; and wood ashes or land plaster on others—each to be determined by trial. Coarse barn manure, although nearly always a strong aid to growth, is too repulsive to be spread in lumps on a lawn near the dwelling, and the only shape in which it may be used is in a fine compost, or in old manure broken fine and spread evenly by passing through a Kemp spreader.

It should be well understood in this connection that the smaller fruits, as raspberries and currants, as well as dwarf pears, should stand in clean, well cultivated ground in all cases, and receive a due share of fertilizers, although dwarf pears after becoming well established may succeed in closely shaven grass, provided the ground is kept annually enriched with manure. These rules are not laid down as unalterable, but are to be modified according to the natural fertility and fitness of the soil.—*Country Gentleman.*

Water Power of Lake Superior.

Colonel Hope, of London, has, says the *Canadian Manufacturer*, organized a company for utilizing the enormous water power of Lake Superior and constructing very extensive works in the vicinity of Sault Ste. Marie. The waters of Lake Superior fall at the Sault about 30 feet to the level of Lake Huron, and the velocity has been recorded by General Powell, of the United States service, as a little more than 90,000 cubic feet a second. Colonel Hope, who has just returned from spending several weeks on the spot, made careful and accurate measurements and calculations, and finds the actual velocity and volume of water to be 122,000 feet per second, equivalent to 236,000 horse power. His company intend to build a tail race five miles long on the Canadian side and a canal five miles long on the American side. These canals will be each 1,000 feet wide, the widest in the world. They will construct large dry docks on both sides, to be filled and emptied by gravitation. They will be the only dry docks in the world, so far as Colonel Hope knows, filled and emptied by this method. On the Canadian side all the principal works will be above the rapids, and on the American side below the rapids. The reason of this is that the land for factories and mills is furnished on the Canadian side above and on the American side below the rapids. There will be blast furnaces and ship yards, and it is expected that there will be paper mills, pulp mills, flour mills and other industries, whose motive power will be supplied by this company, or by one of the several subsidiary companies which it is the intention of Colonel Hope's company to form.

Dr. James Croll.

The death is announced at Perth of that distinguished writer, Dr. James Croll, F.R.S., in his 70th year. Dr. Croll had been suffering for a long time from a mortal malady, but remained at his work almost to the last. Without any of the advantages of early scientific training, Croll raised himself from a very humble social position to that of a recognized authority in his special subjects, notably those connected with the relation of climate to geological phenomena. Some years ago, by the influence of Sir A. Ramsay, Croll, then resident in Glasgow, was appointed an officer of the Geological Survey of Scotland. Although best known by his work on "Climate and Time," he was the author of several others, such as "Climate and Cosmology," "Stellar Evolution," and the "Philosophy of Theism." The originality of his views frequently brought him into controversy with scientific men, who, differing from his opinions, learned to respect him as a doughty atagonis* who had something to say and knew how to say it.

American Lace Curtains.

Messrs. John Bromley & Sons, of Philadelphia, Pa., who at present employ about 2,000 hands making rugs and chenille curtains, have decided to commence the manufacture of lace curtains. Mr. J. H. Bromley has been to England, and after long and careful examination of the various makes of lace machines has placed the order for the whole of the machinery and apparatus necessary to make the finished and taped curtains from the raw material with Mr. John Jardine, of Nottingham.

We understand that Mr. Jardine has undertaken to produce 5,000 pairs of finished curtains per week, in Philadelphia, before turning over the plant to Messrs. Bromley.

Coal in Tonquin.

The seams of coal have been known for something like half a century. They crop out all round the bases of the lowish hills which fringe the shores of the Gulf of Tonquin. One of the seams is 152 feet thick, of almost solid coal. It is a semi-anthracite of very fine quality, having about 87 per cent of fixed carbon and from 7 to 12½ per cent of volatile matter, from 2 to 3 per cent ash, free from pyrites, and of course quite smokeless.

A NOVEL self-acting electrical balance was recently exhibited in Paris. The object to be weighed was placed in the pan, by which the circuit was closed and the motor put in operation which moved the weight out on the beam of the balance. When the equipoise was established the circuit was broken. Upon emptying the pan the weight returned.

Centennial Celebration of the American Patent System at Washington.

This promises to be one of the most interesting and memorable affairs of the day. The following is the preliminary programme:

First public meeting,* afternoon, April 8, 1891. To be presided over by the President of the United States.

Second public meeting, April 8, 7 to 8:30 P. M. To be presided over by the Hon. John W. Noble, Secretary of the Interior.

Special reception to inventors and manufacturers and the ladies who accompany them, at the Patent Office, April 8, 9 to 11:30 P. M., by the Hon. John W. Noble, Secretary of the Interior, and the Hon. Charles Eliot Mitchell, Commissioner of Patents.

Third public meeting, afternoon, April 9. To be presided over by Hon. Frederick Fraley, LL. D., President of the National Board of Trade and the American Philosophical Society, and charter member of Franklin Institute.

Fourth public meeting, evening, April 9. To be presided over by Professor S. P. Langley, LL. D., Secretary of the Smithsonian Institution.

Anniversary Day, April 10.—Anniversary of the signing of the first American patent law—"An Act to Promote the Progress of the Useful Arts"—by George Washington.

10 A. M. Excursion to Mount Vernon, where an address will be delivered by J. M. Toner, M. D., of Washington, upon "Washington as an Inventor and Promoter of Improvements."

Fifth public meeting, evening, April 10.—To be presided over by Prof. A. Graham Bell. Addresses† upon the following subjects are promised at the public meetings:

Edward Atkinson, Ph. D., LL. D., of Massachusetts.—Invention in its Effects upon Household Economy.

Dr. John S. Billings, Curator, U. S. Army Medical Museum. — American Invention and Discoveries in Medicine, Surgery, and Practical Sanitation.

Hon. Samuel Blatchford, Justice of the Supreme Court of the United States.—A Century of Patent Law.

Cyrus F. Brackett, M. D., LL. D., of New Jersey, Henry Professor of Physics, College of New Jersey, Princeton.—The Effect of Invention upon the Progress of Electrical Science.

Hon. Benjamin Butterworth, of Ohio, U. S. House of Representatives.—The Effect of our Patent System on the Material Development of the United States.

Octave Chanute, of Illinois, President of the American Society of Civil Engineers.—The Effect of Invention upon the Railroad and Other Means of Intercommunication.

Professor F. W. Clarke, S. B., of Ohio, Chief Chemist U. S. Geological Survey.—The Relations of Abstract Scientific Research to Practical Invention, with Special Reference to Chemistry and Physics.

Hon. John W. Daniel, of Virginia, U. S. Senator.—The New South as an Outgrowth of Invention and the American Patent Law.

Major Clarence E. Dutton, Ordnance Department, U. S. A.—The Influence of Invention upon the Implements and Munitions of Modern Warfare.

Thomas Gray, C. E., B. Sc., F. R. S. E., of Indiana, Professor of Dynamic Engineering, Rose Polytechnic Institute, Terre Haute.—The Inventors of the Telegraph and Telephone.

Professor Otis T. Mason, Ph. D., of Virginia, Curator U. S. National Museum.—The Birth of Invention.

Hon. Charles Eliot Mitchell, of Connecticut, Commissioner of Patents.—The Birth and Growth of the American Patent System.

Hon. O. H. Platt, LL. D., of Connecticut, U. S. Senator.—Invention and Advancement.

Col. F. A. Seely, of Pennsylvania, Principal Examiner U. S. Patent Office.—International Protection of Industrial Property.

Hon. A. R. Spofford, LL. D., Librarian U. S. Congress.—The Copyright System of the United States; Its Origin and its Growth.

Hon. Robert S. Taylor, of Indiana.—The Epoch-making Inventions of America.

Robert H. Thurston, A. M., LL. D., Doc. Eng., of New York, Director and Professor of Mechanical Engineering, Sibley College, Cornell University. — The Inventors of the Steam Engine.

William P. Trowbridge, Ph. D., LL. D., of New York, Professor of Engineering, School of Mines, Columbia College.—The Effect of Technological Schools upon the Progress of Invention.

Hon. Edwin Willits, of Michigan, Assistant Secretary of Agriculture.—The Relation of Invention to Agriculture.

Hon. Carroll D. Wright, M. A., of Washington, Commissioner of Labor.—The Relation of Invention to Labor.

* It is proposed to hold meetings for the organization of the National Association of Inventors and Manufacturers on the afternoon of April 7, and in the morning on April 8 and 9, and at such other times as may be necessary.

† Addresses are also expected from prominent inventors and manufacturers at the meetings for the organization of the National Association.

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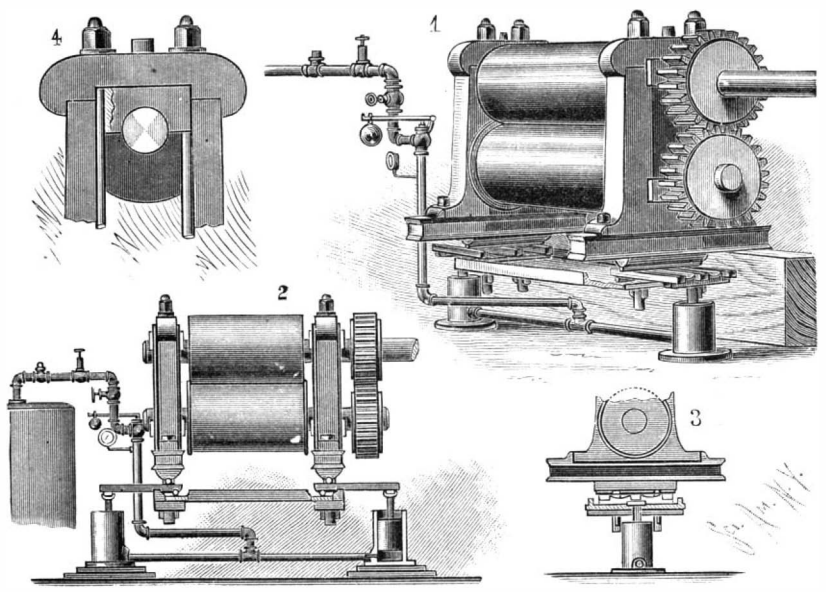
A ROLLER PRESSURE REGULATOR FOR CANE MILLS.

An improvement whereby a uniform and adjustable pressure of the upper roll of a cane mill upon the cane may be obtained, while the roll will yield for a hard substance or an unusually large body of cane, is shown in the accompanying illustration, and forms the subject of a patent issued to Messrs. Samuel M. Malhiot and Camille A. Lejeune, of Albemarle, La. Fig. 1 is a perspective and Fig. 2 a side view of a cane mill provided with this pressure regulator, Figs. 3 and 4 being partial transverse sections. The lower journal boxes are supported in fixed position, while the upper boxes are adapted to slide in the housings, yokes resting on and moving with the upper boxes, while a bolt passes down through each yoke and through the housings, as well as through the base and lower fulcrum bars, a plate, and cross-bars, below which it is keyed. To each of the fulcrum bars is secured a cylindrical steel bar, forming the fulcrums of levers arranged on opposite sides of the machine, the shorter arms of the levers resting upon steel rollers which bear upon the upper face of a plate with side flanges. The flanges retain the rollers in place, and the levers are arranged in two series of three each, their outer ends being connected by a cross-bar. Under each of these cross-bars is a steam cylinder, with its piston rod in contact with the bar. The cylinders are connected by a pipe, through a T in which steam is received from the boiler, the supply pipe having a check valve, a pressure regulator, a throttle valve, and an ordinary safety valve, arranged in the order named, together with a steam gauge indicating the pressure of the steam in the cylinders. When steam is admitted to the cylinders, the reducing valve is made to bring down the boiler pressure to the working pressure required in the mill, and the regulating valve and the safety valve are then set accordingly. A large or small body of cane then passed between the rolls is subjected to a uniform pressure; but when an unusually large body of cane is fed, causing the upper roll to be suddenly lifted, the movement of the pistons causes the check valve to close, and steam is compressed in the cylinders and in the pipes, the safety valve then opening. As soon as the upper roll assumes its normal position, the check valve opens automatically and the work proceeds as before.



MALHIOT & LEJEUNE'S PRESSURE REGULATOR FOR CANE MILLS.

A PROPOSED APPARATUS FOR A FALL OF 1,000 FEET.

Here is an idea on the subject of which it is, perhaps, not without interest to learn the opinion of the public, and which we recommend to American engineers at a time when work on the Chicago exhibition is about to

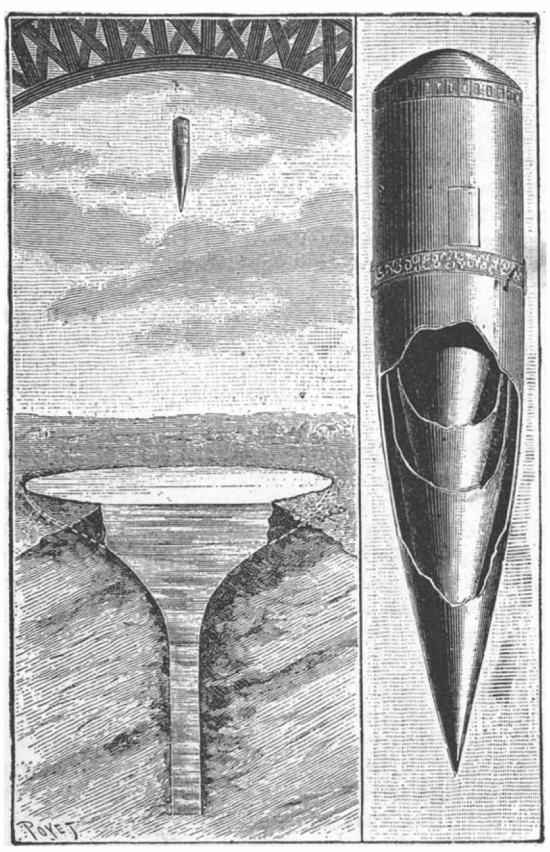


Fig. 1.—CAGE FOR HIGH FALLS IN SPACE AND WELL FOR ITS RECEPTION—DETAILS OF THE SERIES OF CONES.

begin. It concerns a class of matters in which the habitual readers of *La Nature* are all particularly competent to fix an opinion. It is a question of a fact that the great towers that are now in vogue would permit of realizing.

Every one knows the peculiar sensation that one feels in falling vertically from a certain height, in riding down a very steep hill in a sleigh, and especially in descending in an elevator car that is set rapidly in motion. A rapid vertical fall is a source of physiological disturbances that are very keenly felt by many persons. If such a fall assumes an exceptional character of magnitude, it will give rise to a mixture of desire and fear of exposing one's self to it that will constitute a new source of perturbations. These latter are of the same kind as those that a person experiences in rustic swings, toboggan slides, merry-go-rounds, the sight of abysses, etc.

Such is the field to be exploited.

A tower several hundred meters in height and a closed cage constitute the plant. The maneuver is simple: The passengers enter the cage, which is afterward allowed to drop freely from the top of the tower. At the end of 100 meters fall the velocity acquired is 45 meters per second, at the end of 200 meters it is 65 meters, and at the end of 300 meters it is 77 meters. Now the fastest trains make scarcely 30 meters per second, and descents into mine shafts never exceed 15 meters per second.

In order to render this maneuver practical, it suffices to receive the passengers safe and sound at the end of the trip, and to have it possible to rapidly raise the cage again. As regards the first condition, that may be realized without accident by giving the car the form of a shell with a very long tapering point, and by receiving it in a well full of water of sufficient depth.

Mr. Charles Carron, an engineer at Grenoble, has analytically studied the conditions in which the punctuation of the water by such a shell would be effected, and the reactions that the passengers would have to support. The conclusions of this study show that there is nothing, either theoretically or practically, opposed to its construction and to its operation in falls reaching three hundred meters. The accompanying figures give the general aspect of such a shell capable of accommodating fifteen passengers falling from a height of 300 meters. The principal dimensions of the installation would be as follows: Internal diameter of chamber, 3 meters; height, 4 meters; height of mattress, 0·5 meter; height of cone, provided with a series of internal cones set one into the other in order to prevent the air from being compressed in the chamber at the moment of immersion, 10 meters; total weight, 11 tons; displacement of the shell entirely submerged, 30 tons; depth of the well, which is in the form of a champagne glass with hollow foot (a form whose profile has been determined in such a way as to prevent the swell produced by the immersion of the shell from extending beyond the limits of the well), 55 meters; diameter at the upper part, 50 meters; diameter from the depth of 28 meters to the bottom, 5 meters. The passengers would be securely seated in arm chairs that exactly followed the contours of their body.

This mode of high speed carriage, for returning from an ascension of 300 meters, would not fail, through its originality, to please a host of amateurs with a new form of excitement. It appears therefore to possess the wherewithal to tempt a bold builder.—*A. Berges, in La Nature.*

Iridescence of Glass.

The iridescent film in glass is partially soluble in water, the remainder being unattacked by hydrochloric acid, but yielding easily to caustic soda. Both solutions contain sodium, sulphuric acid and carbonic acid. The portion insoluble in acid can only be silica, no lime being found even by the spectroscope. The film exists only on one side of the glass, and must be formed during the final heating, being probably caused by the sulphurous acid in the burning gases, which acts on the surface of the glass, forming sodium sulphate and silicate, the latter being subsequently decomposed into free silica, which separates out in the amorphous form.—*A. Jolles and F. Wallenstein.*

A Novel Sea Barrier.

On the northern shore of the Duddon estuary, in the county of Cumberland, there has been steadily worked during the last twenty years or more an important mine, producing a large quantity of rich red hematite iron. The ore having been excavated or "won" as close to the sea margin as it has been possible to work without letting down the surface of the land and admitting the influx of the sea, thereby drowning the mine, the company have recently obtained a fresh lease, undertaking to construct a barrier to keep back the sea along that portion of the estuary in front of the mine, in order that they might "win" the ore from underneath some twenty-six acres of the sea bed. To effect this object a massive and substantial sea barrier has now been constructed. This may justly be regarded as unique in character, inasmuch as it is at one and the same time a breakwater and a water tight dam. By means of this work the sea was about three months since finally and successfully excluded from the area above mentioned. This great sea barrier presents an imposing appearance. It is just two-thirds of a mile in length, and for about one-half this length is fully 50 feet in height from the bottom of the foundations to the top of the parapet. At high water of high spring tides there is a depth of rather more than twenty feet against the seaward face of the work; but, being exposed during southwesterly gales to the full force of the waves sweeping up the Irish Channel, backed by the Atlantic rollers, the sea at such times breaks with great violence against the new barrier, as was, of course, expected, and has been provided for in the structure just completed. The engineer of the work is Sir John Coode, and the contractors are the well known firm of Messrs. Lucas & Aird. There is every reason to believe that the anticipation of the directors and shareholders of being able to continue the working of the iron ore over a further period of 25 years may be realized.—*British Trade Journal.*

To Prevent Electricity on the Printing Press.

Wet a cloth with water and wring it out well until it is only damp, then pour a little glycerine upon the damp cloth and wipe the surface of the tympan sheet with it, only on that part of the sheet where the impression is, as it is there that the reaction is effected—at the point of pressure. Do not put on too much glycerine, as it will wrinkle the sheet too much. Simply go over it as you would in oiling the sheet to prevent offset, but do not saturate it. If you find that one application or wiping will not stop the trouble, go over the impression parts again in the same manner. Some kinds of stock are more susceptible than others,

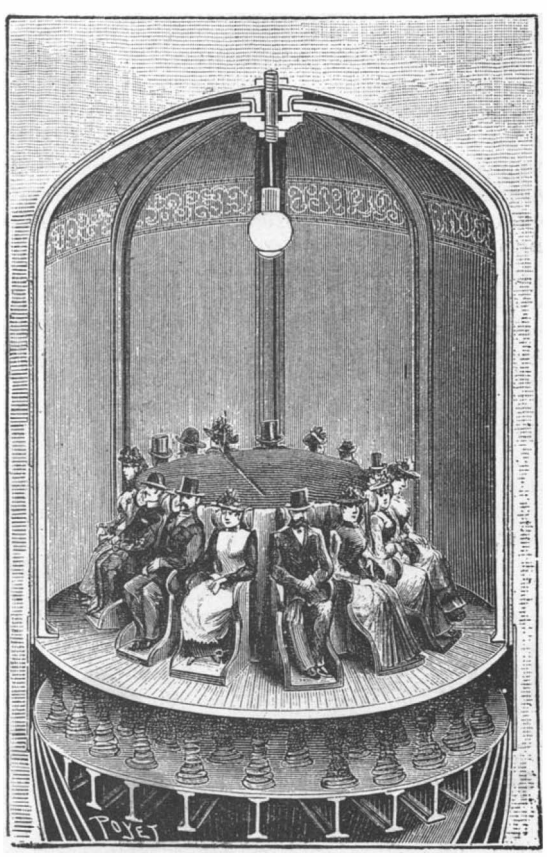


Fig. 2.—INTERNAL VIEW OF THE CAGE.

and call for an additional application.—*American Art Printer.*

PHOTOGRAPHY is being used in the Paris morgue to determine, if possible, identification of the deceased. A photograph on a large scale is taken of the hands and put on exhibition. Persons are frequently identified either by scars of injuries or marks of various kinds which indicate the probable occupation.

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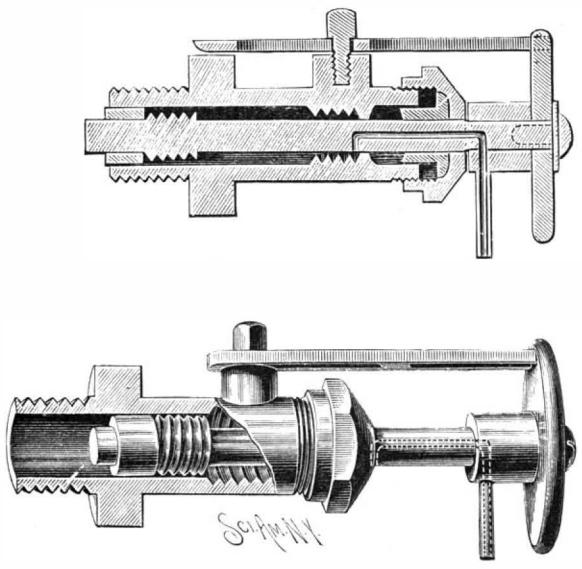
AN IMPROVED GAUGE COCK.

The illustration represents a gauge cock which may be packed at any time when in use and under boiler pressure, with which no valve or seat is used, and which requires neither lever, crank, nor weight for its operation. It has been patented by Mr. Marshall J. McCarter, of



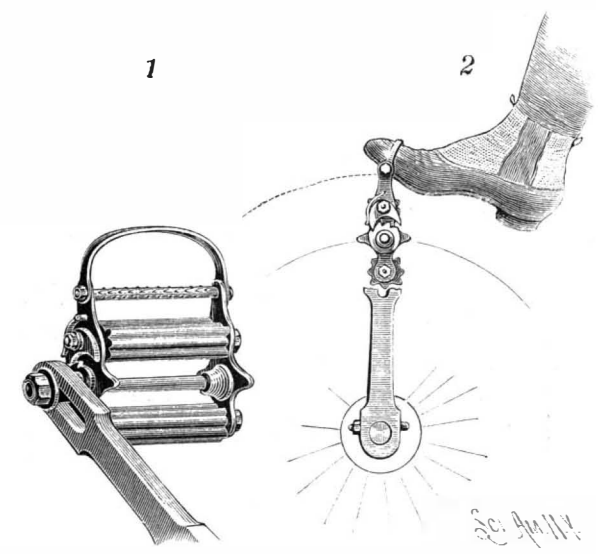
McCARTER'S GAUGE COCK.

Norristown, Pa. The casing or barrel of the device has at one end an exterior thread adapted to screw into the shell of the boiler, or be connected with a pipe therefrom, and a piston sliding loosely in the bore of the barrel is held on a rod passing through a stuffing box in the outer end of the barrel, the rod being provided with a suitable handle. In this rod is a bore having one end adapted to open into the bore of the barrel, the other end of the bore connecting at all times with the outside.

The two figures are side views of the device, partly in section, and when the piston is in the position shown in the lower figure, both ends of the bore in the rod are connected with the outside, as represented by dotted lines, so that steam or water passing the piston cannot pass to the outside, on account of the stuffing box packing the rod tightly. On the handle is a guide, through a slot in which passes a screw screwing into a lug on the casing, the guide preventing rod and piston from turning, and limiting their inward and outward movement. A thread is formed on the rod near the piston, adapted to engage a thread in the bore near its outer end. When the gauge cock is applied on the boiler, the steam or water under pressure forces the piston out to the position shown in the lower figure, no steam or water then escaping; but when the handle is moved inward until its hub strikes against the stuffing box, as shown in the upper figure, the bore in the rod then forms a passage between the interior and the exterior, and the engineer or fireman can see whether steam or water escapes, the piston being again forced outward when the handle is released. When it is desired to repack the barrel, the screw is removed from the slot in the guide, and the handle is turned to bring the thread on the rod in engagement with the thread in the barrel near its outer end, thus shutting off communication between the interior and the stuffing box, when the gland can be conveniently removed and the stuffing box repacked, without annoyance from leaking steam or water.

AN IMPROVED BICYCLE TREADLE.

The illustration represents a bicycle treadle designed to lighten the labor of running a machine, and especi-



CUSHMAN'S BICYCLE TREADLE.

ally to facilitate the work of hill climbing, its construction being such as to increase the leverage upon the crank arms on the downward stroke, when, also, the pedals and the cranks are tied together, the improvement being adapted for attachment to any pedal now in use. It is a patented invention of Mr. George W. Cushman, of No. 159 Eighth Avenue, New York City. A ratchet wheel is attached to the crank spindle upon which the pedal turns, between the inner side plate of the pedal and the face of the crank arm, and the pedal has auxiliary side plates of greater length than usual, these side plates permitting the use of two foot-rest bars at each side of the crank spindle. Upon one of the side plates of each pedal is pivoted a spring-pressed pawl adapted for engagement with the ratchet wheel, as shown in Fig. 1, the pawl slipping over the ratchet during the upward movement of the pedals, but engaging the ratchet in their downward movement, thus preventing the pedals from revolving and tying them to the crank arms during a portion of the stroke. The operator is also, by this arrangement, enabled to press downward with greater force upon the forward outer foot rest, the leverage being increased by the distance from the crank spindle to the outer foot-rest bar, as represented by the curved lines in Fig. 2. By this improvement, also, the rider is enabled more readily to overcome a dead center, and should the pedal be accidentally dropped, its increased length facilitates its more ready recovery.

Fifty Miles per Hour.

A correspondent asks if there is a train in the United States that has a scheduled time of 50 miles per hour or more, for 50 miles or over; and to the inquiry we answer, yes, there is; and though we know of but one, there may be others. Train No. 19 on the New York division of the Pennsylvania leaves Jersey City at 4:13 and arrives at Philadelphia at 6:05, making two stops; the distance is 89·76 miles, though it is usually called 90 miles. The running time of this train, including the time consumed in the stops, is 112 minutes, which is almost 48 miles per hour; it runs from Jersey City to Trenton without a stop, the distance being 55·75 miles, in 64 minutes, the arriving time being 5:17, which is a speed of about 52 miles per hour. There are several other trains that make this run from Jersey City to Philadelphia in about 2 hours, the majority exceeding 2 hours by from 2 to 10 minutes; the limited, making no stops at all, makes it in 1 hour and 59 minutes, or 7 minutes more than No. 19, which makes two stops, while No. 43, also making two stops, uses 1 hour and 57 minutes. Trains frequently exceed 60 miles per hour, and it is likely that it is necessary for the above trains to do so daily to make their schedule time, though the one train noted above is the only one that we know of where the schedule time is 50 miles per hour for a long distance. Some 10 years ago, the statement was made that engines were in process of construction for both the Pennsylvania and the Bound Brook route that would enable the schedule time to be made 60 miles per hour, the assertion being made that both roads would have trains in the near future that would make the 90 miles in 90 minutes. They have not yet been placed on the schedule.

The B. and O. has several trains whose schedule time between Washington and Baltimore is 45 minutes, which is 40 miles at the rate of 54 miles per hour. The fastest schedule time for any distance that we know of is on the B. and O., where the time of the "Royal Blue" is, for a distance of a little over 3 miles, at the rate of 72 miles per hour, and it is made too.—*The Railway Conductor.*

A New Insulating Material.

A new insulating material for telegraphic or other electric lines is thus given by the *Revue Industrielle:* It is composed of a mixture of gelatine (specially made), resin oil, oxidized linseed oil, resin and paraffin. It is cheap and contains no sulphur. The proportions of the mixture are: Glove glue (*colle de gant*), 1,000 parts; resin oil, 100 parts; oxidized linseed oil, 500 parts; colophane, 150 parts; paraffin, 250 parts. The glue is prepared by taking the refuse clippings of gloves, and soaking them in cold water for one night. The next day they are strained and washed in several waters until the water is clear. In an iron boiler there are then placed 1,000 parts of water, five parts of carbonate of soda, and dry glove skin 250 parts. This is boiled for six consecutive hours, the water being renewed as it evaporates. The whole boiling mass is next run over a sieve, across which steam is passed to prevent the gelatine coagulating. The boiling solution is received by a wooden tub, through which a current of warm air is passed for one hour. The residue left in the sieve is boiled up with water for three hours, and when filtered can be used again for dissolving the glue, but this time with only 200 parts of glove skin. The gelatinous solution is put into a boiler with the olein or oleic acid used in candle manufacture in the proportion of gelatinous solution, 1,000 parts; olein, eighty parts. This is boiled for half an hour, after which ten parts of caustic potash solution (fifty parts water) is added. The boiling is maintained for an hour, so as to saponify the olein and form a soapy pulp. The glove glue being prepared, resin oil, linseed, colophane and paraffin are added in the proportions above stated; the whole is boiled until homogeneous. This boiling generally lasts about four or five hours.

A VELOCIPEDE OPERATED BY HAND LEVERS.

The illustration represents a vehicle patented by Mr. Clarence P. Hoyt, the use of which is calculated to expand the chest and develop the muscles of the arms, while it is designed to be a very strong, durable, and easily managed machine. The main frame consists of two vertical bars, through which passes the axle, and two upwardly and rearwardly extending bars, which may be made integral with the vertical bars, the backbone being connected at one end to the tops of the vertical bars, while its other end carries a caster wheel. The backwardly extending bars of the frame have bearings for a crankshaft on which is keyed a sprocket wheel, a chain from which engages a small sprocket wheel on the main axle. Just outside the vertical bars of the main frame, two vertical lever bars are fulcrumed on the axle, a handle piece being secured to the connected upper ends of the lever bars, while a rod extends rearwardly from their lower ends to a pivoted lever bar, from which a connecting rod extends to wrist pins on arms of the crank shaft, whereby, on reciprocating the levers by means of the handle piece, the crank shaft is turned and motion is communicated to the main axle to propel the machine. Extending forward from the caster wheel bracket, on each side, is a rod passing through a slotted arm secured to the underside of a pivoted pedal, the rods carrying stops in advance of the slotted arms, and the forward ends of the rods being connected to the forward ends of the

HOYT'S VELOCIPEDE.

pedals by spiral springs. With this arrangement, the depressing of a pedal draws upon one of the rods and turns the caster wheel, pressure on the right hand pedal guiding the vehicle to the right, while the depressing of the left hand pedal turns the vehicle to the left.

Further information relative to this invention may be obtained by addressing the patentee, box No. 536, Golden, Col.

Precious Metals Mined in 1890.

The annual report of Wells, Fargo & Co. of precious metals produced during 1890 in the States and Territories west of the Missouri River, including British Columbia, shows: Gold, $32,156,916; silver, $62,930,831; copper, $20,569,092; lead, $11,509,571. California produced in gold, $9,896,851, silver $186,263; Nevada, gold, $2,693,884, silver, $6,546,652; Oregon, gold, $965,000, silver, $71,000; Washington, gold, $194,000, silver, $85,000; Idaho, gold, $3,595,333, silver, $10,229,167; Montana, gold, $2,764,116, silver, $12,050,339; Colorado gold, $4,210,961, silver, $13,064,486; Utah, gold, $88,798, silver, $12,170,377; New Mexico, gold, $376,034, silver, $1,282,951; Arizona, gold, $1,150,486, silver, $6,446,863; Dakota, gold, $3,045,560; Texas, silver, $249,423; British Columbia, gold, $361,555; Mexico, gold, $12,689,000, silver, $415,645,000.

THERE is no doubt but the form of a roof has much to do with the draught of a chimney. The flat roof offers no resistance to the passage of air, but as the pitch is increased, the current is more and more disturbed, until with a high-pitched and many-gabled roof it is broken into innumerable eddies, some of which are sure to curl down and force the smoke and gases in the flue into the rooms below. Chimneys on such roofs should be built higher than ordinarily.

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Correspondence.

Ice Forming under Water.

To the Editor of the Scientific American:

Your answer to query No. 2,719 leads me to ask: What makes ice form on the bottom of rivers sometimes more than others? I have often observed it adhering to the smooth stones on the bottom of quite large streams, as if it was frozen there, which at other times will not be seen, although the anchor ice may be running plentifully, and the atmosphere quite as cold. No apparent change in the water, it being as clear as ever; nor is the ice charged with sediment or anything to make it heavier. It has the appearance of having formed there, though perhaps several feet below the surface of the water. I saw it once during the present month in the Kalamazoo River. G. W. GRIGSBY.

Allegan, Mich., Jan. 24, 1891.

[It is well known that running water will cool to several degrees below the freezing point without freezing on the surface. At this temperature the stones on the bottom will also be cooled down to a like temperature, when the film of water next the surface of the stones will freeze to the surface because it becomes quiet by contact with the surface. Thus the stones will continue to gather by surface freezing to considerable thickness, and ice so formed may remain until a change of weather or until the surface freezes over, when the temperature of the running water will rise and melt the anchor ice by heat from the earth. The floating ice is not anchor ice.—ED.]

Deterioration of Water in Reservoirs and Conduits.

At a recent meeting of the New Jersey Sanitary Association, Mr. C. B. Brush dealt with the above subject in a paper. He remarked that all water supplies are better at certain periods of the year than at others. In the hot, dry days the water becomes dead and lifeless; and if allowed to remain at rest for any considerable length of time, algæ formations appear on the surface. These, however, are destroyed and disappear as soon as the water is put in motion. If allowed to remain, the water cures itself—the algæ disappearing after a few weeks, and leaving the water again in its normal condition. The algæ show themselves more quickly on water that has been filtered, either naturally or artificially. The author also stated that water is delivered in its best condition when taken from a running stream and supplied directly to consumers without coming to rest during its passage. Water discolored by sediment is very often in its best condition, because the sediment is due to the fact that an abnormal volume of water is blow off from the watersheds, and any pollution there may be is so diluted as to be incapable of harm. But there is such a demand for clear water that reservoirs are necessitated, with their attending evils. Water that is stored for twenty or thirty days commences to deteriorate. This is due to stagnation; and the stagnation begins to manifest itself as soon as the oxygen in solution in the water becomes less than 0·3 per cent. The best means of preventing stagnation consists in keeping the water in motion; and there is no better way than by forcing air into the bottom of the reservoir, and keeping the water aerated. Mr. Brush gave an interesting account of his experience with a number of reservoirs where the water had become tainted in consequence of lying stagnant; and in every instance he obviated the difficulty by forcing air into the reservoir or the mains.

Composition of Talcum.

Talcum, or soapstone, also known as steatite, is a silicate of magnesium containing generally iron and other impurities.

F. W. Clarke and E. A. Schneider have recently examined some talcum with the following results. The sample of talc with which the experiments were carried out came from Hunter's Mill, Virginia, and when dried in air gave the following analysis:

	Per cent.
Silica	62·27
Alumina	0·15
Ferric oxide	0·95
Magnesia	30·95
Ferrous oxide	0·85
Manganous oxide	Trace
Water (loss at 105°)	0·07
Loss on ignition	4·84
	100·08

These figures agree closely with the empirical formula $H_2Mg_3Si_4O_{12}$.

Standing Bareheaded at Funerals.

The London *Lancet* deprecates the practice of remaining bareheaded at funerals. It commends the propriety of cutting short the burial services in cold and inclement weather, and suggests that the hats should be kept on the heads of those in attendance. These suggestions should certainly be approved of, for a funeral ceremony, as at present carried on, involves much risk of contracting grave inflammation of the respiratory organs.

The Telephone Patents.

In December the fundamental patent on the speaking telephone granted in England to Alexander Graham Bell expired, and our British cousins are congratulating themselves on relief from a monopoly that has made itself somewhat obnoxious to them. Competition has already sprung up and telephone rates have been reduced. In view of these facts it may be worth while briefly to review the principal patents that have enabled the Bell Telephone Company to hold its own against any and every attempt at competition, and to note in what state their successive expirations will leave the art of telephony. The fundamental patent was granted on the 7th of March, 1876, just 21 days after the filing of the application. Its principal feature is the enormously sweeping fifth claim for transmitting vocal sound by electrical undulations, that has successfully held its own against every inventor. As is now well known, the patent was entitled "An Improvement in Telegraphy," and the other claims are comparatively unimportant, as the transmission of speech is not mentioned in them. The armature of the rudimentary form of telephone, shown in the drawings, is supported at a single point and actuated mechanically by a flexible diaphragm. This patent will expire on March 7, 1893, its life being quite unaffected by the expiration of the English patent, since the latter was taken out after the American one was granted. It will be seen, therefore, that on the expiration of this patent the broad principle is thrown open, and operative receiving and transmitting instruments can be freely manufactured.

But it should be remembered Alexander Graham Bell took out a second patent on the 30th of January, 1877, covering the important features of the form of receiver generally used in every part of the world. His claims cover the diaphragm of magnetic material, and means of adjusting it to its proper relation with the magnet. This second patent will probably enable the ordinary forms of construction to be held from public use until January 30, 1894, after which day the receiver substantially as now known will become public property. As to the transmitter, the case is somewhat more complicated. The principal patents on the carbon transmitter were granted to Thomas A. Edison, on April 30, 1878, are now controlled by the Bell Telephone Company, and will expire April 30, 1895. The Edison transmitter is successful, but has not been in very general use.

The form of transmitting instrument most widely employed, especially for long distance work, is that patented by Hunnings. It is an English invention, and the American patent, granted August 30, 1881, will expire with the previous English patent on September 16, 1892; it is, however, antedated by the Edison patent, so that the Bell Telephone Company will hold a claim on the carbon transmitter until the expiration of the latter. The Blake form of transmitter is the subject of a group of patents dated November 29, 1881, but is the result of the division of an application filed January 3, 1879, and the entire group patented in England in that year will pass out of legal existence on January 20, 1893.

There is, however, a patent to Berliner, also owned by the Bell Telephone Company, covering the same principle which is used in the Blake transmitter, that of varying contact between two electrodes; this will expire on January 15, 1895, and includes the induction coil apparatus now usually employed. It will thus be seen that while the receiver becomes public property, at least in some of its forms, in 1893, the group of transmitter patents are likely to tie up that part of the telephonic system for nearly two years thereafter. Of course the Bell receiver can be made to work quite successfully as a transmitter, and it is altogether probable that modifications of it will be found to operate far more successfully than is generally supposed. In any contingency a thoroughly successful telephone for anything except long distance lines can be manufactured by any one who chooses, after the expiration of the second Bell patent, January 30, 1894. A single additional contingency with respect to the carbon transmitter may be mentioned.

This instrument has been claimed by the notorious Daniel Drawbaugh, his chief opponent in the Patent Office being Edison. The Drawbaugh application was filed considerably later than Edison's, but possibly might be ruled to come within the statutory limitations if there were no serious opposition. It is within the bounds of possibility then that an effort might be made to tie up the transmitter for another long term of years by establishing a legal priority for Drawbaugh in default of an active opposition in behalf of Edison. Such a combination of circumstances might come about if the Bell Telephone Company were interested in allowing the issue of a patent to the alleged Pennsylvania inventor. This statement of the condition of the telephone patents is necessarily incomplete, since we have made no attempt to discuss all the accessory apparatus that is in use to-day; but it will have served its purpose if it calls public attention to two things: first, the expiration of the fundamental telephone patent, and the way in which this blessing is mitigated by the transmitter patents; and, second, to possible legal machinations for securing a continued monopoly on the carbon transmitter.—*Electrical World.*

Carbonizing Wool and Rags.

In order to remove burrs, especially the mestiza spiral burr, and other vegetable matters from wool, it becomes necessary to use a chemical process to destroy the same without injuring the wool fibers. I will now, says a writer in *Wade's Fiber and Fabric*, endeavor to describe a process as used in Europe:

1. We must have a wooden tub, say 3 feet wide, 6 feet long, and 3 feet deep, covered on the inside with sheet lead. Fill the tub about three-fourths full with cold water, and add sulphuric acid until your thermometer shows 3° R. Enter the wool that has been thoroughly scoured. See that the liquor covers the same all over, and keep it so in the liquor from one to two hours, according to the amount of vegetable matter in the wool. On the back of your tub have a wooden rack, so you can throw your wool upon it, and let the liquor drain back into the tub. Keep the strength of your liquor 3° R. In nailing on the rack use copper nails, as iron ones are destroyed in no time. The men handling the wool in the acid should wear long rubber gloves.

2. From there it goes to the extractor, and is well extracted. The extractor should be made of copper, and the netting covered with lead. I have seen one covered with vulcanized rubber, which I understand gives satisfaction.

3. The wool is now put on an ordinary wool drier, and is thoroughly dried. The netting of the drier should also be leaded.

4. The wool now goes in the carbonizing oven. This is a large wooden box with drawers made from sheet iron, and leaded wire netting about 4 feet wide, 6 feet long, and 6 in height. On these drawers the wool is spread loosely, and kept four to six hours at a temperature of from 180° to 190° F. There should be an electrical arrangement connected with the thermometer that will ring a bell when the temperature of the oven gets too low or too high. As soon as the burrs get black and you can rub them to powder between your fingers, the wool is ready, that is, the burrs are carbonized. The oven has to be well ventilated, so that the fumes of the acid, generated by the heat, are taken away as quickly as they arise. This is done by means of a fan.

5. The wool now goes to a duster, enters the machine by a series of close-set steel rollers that crush the carbonized burrs, which are then shaken out by a pan and sticks.

6. The wool is now all clean, but has still the acid in it, which has to be neutralized with a cold soda ash bath about 3° R. strong. This can be done in a wooden tub, and then rinsed out with cold water or in a scouring machine. The wool is now all ready for the dyehouse.

The process of carbonizing rags is the same, only use a little stronger liquor and let them stay longer in it. After the cotton is thoroughly carbonized, so that if you rub the rags the cotton threads fall out as dust, put them in a wool duster and dust well. Neutralize the acid the same as in the wool.

Cork Worms.

Investigation in France proves the existence of two or three types of moths in wine cellars. The grubs feed on the fungoid growth that forms on the wine vats and mouldy corks. The insect bores and forms galleries in the cork nearest to the glass, and through the holes thus formed air gains access to the wine, spoiling it.

The San Francisco *Chronicle* says: Our chief difficulty in bottling wines has been in obtaining a supply of perfect corks. At least 25 per cent of corks, after examination for fitness, are rejected. An examination of several bins was made at the vineyards, and it was found that the corks were perforated, and in some cases the wine oozed through them. Now we are trying a method to stop the inroads of these grubs. After soaking the corks in hot water and then in brandy they are dried, and when they are put into the bottles the tops are coated with a layer of paraffine wax previous to sealing them with ordinary wax. We hope by the use of the paraffine compound to stop the ravages of these insects. Neither the grubs nor insects feed upon the wine, but simply use the cork as a place to deposit their eggs, and the coating may possibly prevent their entrance.

Snow Worms.

A puzzling phenomenon has been noticed frequently in some parts of Valley Bend District, Randolph County, Va., this winter. The crust of the snow has been covered two or three times with worms, resembling the ordinary cutworms. Where they come from, unless they fall with the snow, is inexplicable. The snow is two feet deep, and the crust is too strong for them to have come up out of the ground. A square foot of snow can scarcely be found some days without a dozen of these worms on it.

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THE UNITED STATES LIFE SAVING SERVICE.

Upon the ocean and lake coasts of the United States there are now about two hundred and twenty-six government life saving stations. Of these, one hundred and sixty-five are on the Atlantic shores, eight on the Gulf of Mexico, eight on the Pacific, and forty-five on the great lakes; and one, a river station, at Louisville, Ky., on the falls of the Ohio River. The work of the Federal service is re-enforced to a certain extent by private association. Thus a portion of the New England coast is guarded by the Massachusetts Humane Society, a volunteer organization noted for its efficient work.

The distribution of stations is regulated by the nature of the coast and the amount of commerce passing by or approaching it. From the eastern extremity of the coast of Maine to Cape Cod there are but sixteen stations for 415 miles. The coast, for a great part rocky and precipitous, gives numerous harbors of refuge. Along Cape Cod a dangerous region appears, where there are ten stations, about eight miles distant from each other. The bight formed by the shores of Long Island and of New Jersey, with New York harbor at the apex, is renowned for its dangerous nature. Along 250 miles of the shores of this much frequented waterway there are 79 stations, giving an average distance of about three miles from station to station. Further south there is less commerce, and fewer stations are provided. For 175 miles from Cape Hatteras south to Cape Fear there are but six stations, the distance between stations averaging nearly 30 miles. The coast of Florida is of such formation that vessels are generally wrecked close to shore and the crew can save themselves. Refuge stations for the supply of food and water are provided along the uninhabited portions of this coast. Their average distance apart is 26 miles. At each mile along the coast a guide post is erected, giving the distance and direction to the nearest refuge station. Each has provisions enough for twenty-five persons for ten days.

The great lakes have a coast of 2,500 miles extent. Most of the harbors of refuge are artificial, defined by piers and maintained by dredging. These are the scenes of most of the wrecks, as vessels in storms make for the nearest of them, and are liable to strand upon shoals at their mouths. Forty-five stations protect this great extent of coast, being generally placed at or near harbors.

The whole system is under the Treasury Department. Its chief officer, the general superintendent, is appointed by the President; under him is an assistant superintendent, appointed by the Secretary of the Treasury. From the revenue cutter service inspectors are appointed who make monthly visits to the stations and conduct annual examinations of the station employes. They also make special investigations of wrecks with loss of life, and do other services as required. The stations are assigned to districts, for each of which there is a district superintendent, with, in one case, an assistant superintendent. Under these come the station keepers and station employes.

The station keeper is selected with the greatest care, as he is in direct control of the work of the station and is in absolute command of his crew. He and the district superintendents are *ex-officio* inspectors of customs. The keepers are also statutory guardians of all wrecked property until relieved by the owners or their agents. The selection of a crew is left in the hands of the keeper. The regular crew at an Atlantic coast station consists of six men with an additional man from the 1st of December. The active season extends on this coast from September 1 to May 1, taking in the fall, winter, and spring months. On the lakes the term is reversed, extending from April 15 to about December 15, including the summer months.

After a man has been selected by the station keeper for engagement on a life saving crew, he is subjected before appointment to a rigid examination as to his qualifications. After appointment he can only be discharged, with the exception of two cases, by the general superintendent's authority for good and sufficient reasons. In cases of neglect of patrol duty or insubordination at a wreck, the offender is subject to instant dismissal by the keeper. Where disability or death has been incurred by accident on duty, there is a system of pensioning that cannot be extended beyond two years.

The patrol system is regarded as one of the most important branches of the service. Under its provisions a constant watch is maintained all night long offshore. The hundreds of miles of cost are patrolled nightly by the surfmen charged with the duty of warning off vessels approaching dangerously near the coast. The service probably saves more lives by its patrol system than by its operations at wrecks. It acts to supplement the lighthouse department, notifying vessels of their proximity to shore. The work includes a carefully verified patrol of the shore, with constant watching for and warning of vessels. Where stations are near to each other, the surfman starts out when his hour arrives, and walking along the coast as near to the shore as practicable, proceeds on his beat until he meets the patrol from the next station. Each has a metallic check, which they exchange and then return. If they do not meet, the one man continues his patrol to the next station, exchanges checks, returns, and reports accordingly. One of the checks is shown in the illustration, Fig. 14. A record is kept by their means of the patrolling. At isolated stations a post marks the end of the beat. A watchman's time detector is carried by the patrol, who finds the registering key attached to the post. With this he marks the dial, thus registering his time of reaching the end of his beat.

The patrolman carries with him a beach lantern and some red Coston light signals, Figs. 7 and 8. These light by percussion. If the patrol discovers a wreck or vessel in distress or danger, he ignites the signal, Fig. 1. This warns the ship offshore if there is time, and at the worst assures the crew of assistance.

The work at a wreck, such as shown in Fig. 3, is executed by boat or by hawser tackle and breeches buoy. When possible the boat is used in preference. The entire responsibility of choice of methods rests with the station keeper, and he is held to rigid accounting for any error resulting in loss of life.

The favorite type of boat is a development of the surfboat used by fishermen along the New Jersey and Long Island coasts.

They are built of cedar planks on a white oak frame, vary from 25 to 27 feet long, 6½ to 7 feet beam, and 2 feet 3 inches to 2 feet 6 inches deep, with 1 foot 7 inches to 2 feet 1 inch sheer of gunwale. The bottoms are flat. They draw only 7 or 8 inches of water and weigh 700 to 1,100 lb. They are propelled by six oars, and can land fifteen persons, though this is more than they are calculated for. They are in great contrast to the 4,000 lb. self-righting lifeboats of the English service. So far the record is all in the favor of the lighter boat, which has no air tanks and hitherto has not been self-baling, as a rule. It is hoped that the last named feature, used in some of the boats, may be successfully introduced in all.

The boats are taken to the shore on a wagon, as shown in Fig. 2. As they reach the water's edge, one end is lifted, a pin is pulled out of the reach of the wagon, and a single pair of wheels are pulled from under. The same is done for the other end, and the boat is launched. A favorable moment is taken for the launching through the surf. In one minute the boat and crew can be afloat.

The keeper steers with a long oar over the stern, held in a closed swivel rowlock or rope grummet. He and his crew work in perfect touch with each other. By the steering oar he works the boat so as to take the breakers head on, and the crew by their training are responsive to his slightest word or look. The crew wear life preservers, shown in Fig. 4, of which a supply is carried in the boat. The boats also carry a canvas drag or sea anchor with tripping line. This when thrown over with a good length of line holds their head to windward in emergencies or acts as a drag upon them in breakers, enabling them to be maneuvered under difficult conditions of rapid surface drift and current.

The life saving boat represents only one phase of operations.

Much of the work is done by life line and breeches buoy. A gun, shown in Fig. 3, or a rocket, Fig. 9, is used to throw a light line over the wrecked ship. The gun practically is the universal method. The crew of the wrecked vessel haul this in, and to its end is attached a rope, and to the shore end of this is fastened a continuous endless rope reeved through a block and called the whip line. Sometimes, where a large gun is used, the intermediate line is dispensed with. The crew of the wrecked vessel haul in the line until the whip line block reaches them. This has attached to it a board, Fig. 11, with directions in English and French.

The block of the whip line, according to these directions, is to be secured to the lower mast or as high as possible to the hull of the wreck. By means of the whip line the end of a hawser is brought on board and secured near the whip block. Upon the hawser a block carrying a buoy provided with a canvas receptacle resembling a species of breeches, called a breeches buoy, Fig. 6, is reeved so as to travel back forth, being attached to the whip line and worked by it. The wrecked crew have to attend to the installation on their ship of these means of rescue, and experience shows the sailor to be exceedingly stupid in contributing to his own succor. On shore the tackle is sustained by a crotch or shear legs, guyed or braced to a sand anchor in its rear, as shown in the cut. When all is ready the wrecked people are brought ashore one by one in the breeches buoy. The same tackle may be used for the Francis lifecar, shown in Fig. 5. This is a closed metallic boat that can hold six or seven people. Its use on our coasts is limited, the breeches buoy and surfboats doing most of the life saving.

What is called by the surfmen a sausage light, shown in Fig. 13, in use in the wreck scene, is suspended from a tripod on shore to illuminate the beach in wrecking operations.

It has been found practicable to dispense with the hawser on occasions, the traveling block working on one lay of the whip line. The complete system contemplates the use of the independent hawser for the traveling block.

It is obvious that to successfully conduct operations with the life lines and breeches buoy, considerable experience is necessary. Accordingly a constant system of practice is maintained at the stations. A pole is set up on the shore, preferably in the shallow water near shore. This is at 75 yards distance from the place of practice, and represents the mast of a vessel. The crew are first called upon in the boathouse by number, and are examined orally. They have to recite in proper sequence the details of the exercise as set down in the service manual. At the words of command they then fall into place at the drag rope and draw the apparatus to the drilling ground. A man has been placed upon the mast. At the word "*action*," the crew proceed to rig the apparatus and bring their comrade down from the pole in the breeches buoy. The time required is noted and recorded. If in one month after the active season commences the work cannot be done in five minutes, the men are cautioned. Further action is rarely necessary. An active rivalry exists between many of the stations. The mimic rescue has been effected in two minutes and thirty seconds. This was in daytime; at a night drill the same has been done in three minutes. In addition to the wrecking drill, in every week are included the following: Boat practice, including launching and landing through the surf with at least half an hour's rowing; practice in signaling with miniature flags and with oral examination as to the general features of the international code; and the recitation of four methods of rescuing the apparently drowned, with practice of manipulations upon the person of one of the men. When this ceaseless round of practice work is superimposed upon the patrol and other duties, it will be seen that the time of surfmen is very fully occupied.

On their monthly visit the inspectors mark in their drill books the proficiency of each member of the station force. A scale of ten maximum is adopted. The notes are reported to the general superintendent, where the record of the rating of every man in the force is kept.

The operations of the entire life saving service are under the charge of General Superintendent Sumner I. Kimball. Our thanks are due to Capt. Charles A. Abbey, inspector for this district, for courtesies received.

The Flower Clock.

The hour at which each flower opens is itself so uniform that, by watching them, floral clocks of sufficient accuracy can be arranged. Father Kircher had dreamed of it, but vaguely and without pointing out anything; it is to Linnæus that we must ascribe the ingenious idea of indicating all the hours by the time at which plants open or shut their corollas. The Swedish botanist had created a flower clock for the climate which he inhabited, but as, in our latitudes, a more brilliant and radiant dawn makes the flowers earlier, Lamarck was obliged to construct for France another clock, which is a little in advance of the Swedish one. We quote from Pouchet:

Hours at which the flowers open.	Plants on which the observations were made.
Morning.	
3 to 5 o'clock,	Tragopogon pratense (yellow goatsbeard or salsify).
4 to 5 "	Cichorium intybus (chicory).
5 "	Sonchus oleraceus (sow thistle).
5 to 6 "	Leontodon taraxacum (dandelion).
6 "	Hieracium umbellatum (umbellate hawkweed).
6 to 7 "	Hieracium murorum (wall hawkweed).
7 "	Lactuca sativa (lettuce).
7 "	Nymphæa alba (white water lily).
7 to 8 "	Mesembryanthemum barbatum.
8 "	Anagallis arvensis (field pimpernel or poor man's weather glass).
9 "	Calendula arvensis (field marigold).
9 to 10 "	Mesembryanthemum crystallinum (ice plant).
10 to 11 "	Mesembryanthemum nodiflorum.
Evening.	
5 o'clock,	Nyctago hortensis.
6 "	Geranium triste.
6 "	Silene noctiflora.
9 to 10 o'clock,	Cactus grandiflorus.

—*Nature's Realm.*

Low Prices for Steel Rails.

In consequence of differences between the manufacturers, steel rails have lately been selling at pretty low figures, one company having actually sold rails at $26 per ton. It is now said that an agreement has been effected between the producers, and the price has been advanced to $29 to $30 per ton. The manufacture of steel rails is now controlled by the Illinois Steel Company, the Carnegies, the Lackawanna, Cambria, Pennsylvania, and Bethlehem companies.

ACCORDING to Herr Japing, the hourly rate of water falling over Niagara Falls is 100,000,000 tons, representing 16,000,000 horse power; and the total daily production of coal in the world would just about suffice to pump the water back again.

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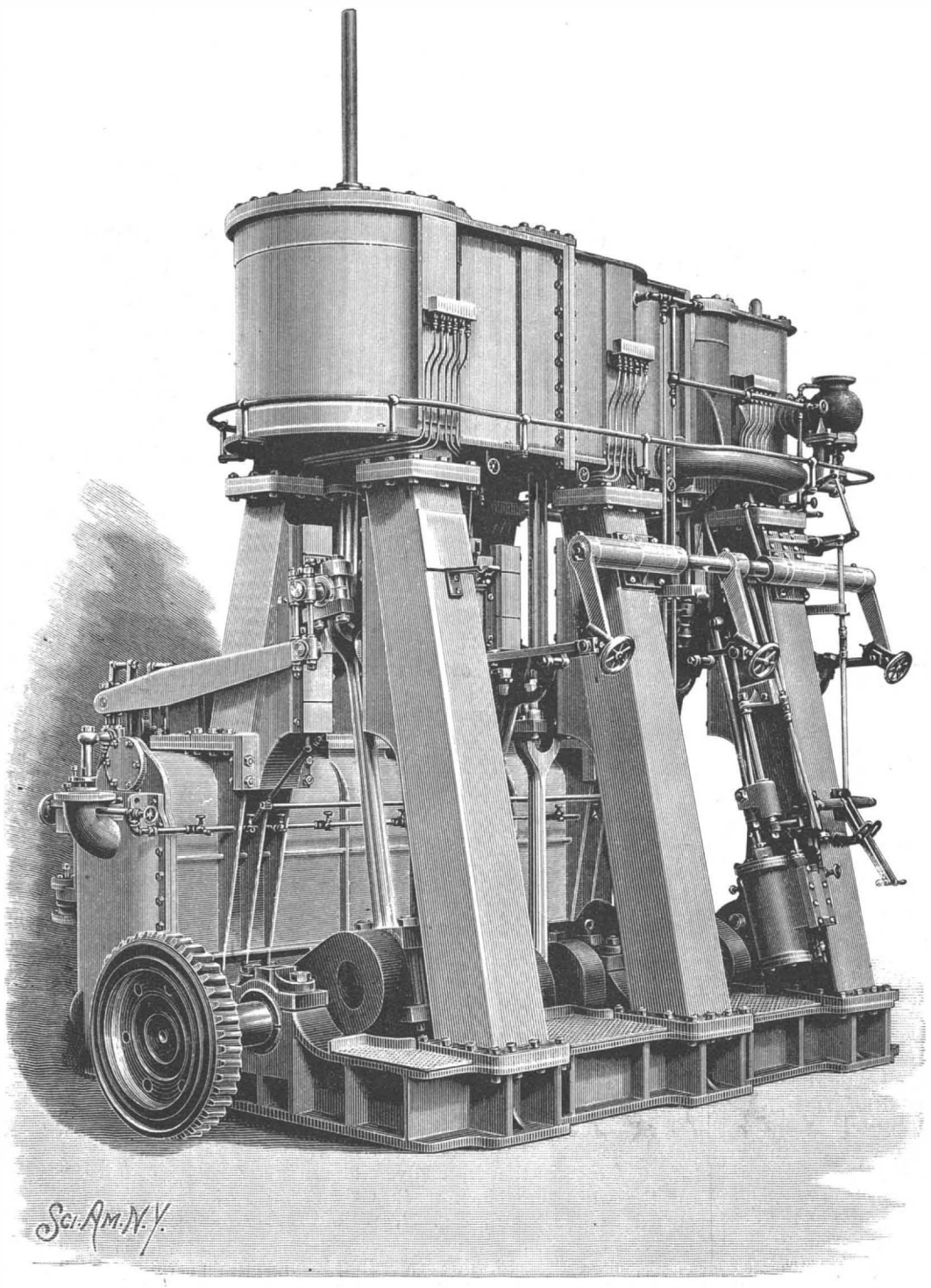
TRIPLE EXPANSION ENGINES FOR A TUGBOAT.

The seaboard coal-carrying trade, especially that from the Delaware and Chesapeake to the large Eastern cities, has for a number of years furnished employment to a class of powerful tugs, capable of towing two and sometimes three loaded barges, carrying from 1,000 to 3,000 tons of coal each per trip. Some of these barges are especially constructed of iron for this service, while others may be the hulls of large ships displaced from business in other lines, a large variety of craft being thus employed during particularly busy seasons, their almost constant presence in some portions of Long Island Sound and in the waters in the vicinity of New York City being at all times a noticeable feature. The tugs used in this service must, however, be very powerful and adapted for considerable sea service, while the conditions of the business require their being run with the utmost efficiency possible.

The engines shown in the accompanying illustration are those of a boat of this class, the Triton, built by the Atlantic Works, East Boston, Mass., and owned by Capt. Fred. Luckenbach, of this port. The vessel is a fine representative of a new and staunch type of tug especially adapted for such service, with a length of 130 ft. 10 in., beam 26 ft. 6 in., depth of hold 14 ft. 6 in., and draught 13 ft. 6 in., the hull being of white oak, copper fastened. The engines are of the inverted vertical triple expansion description, with a high pressure cylinder of 15½ in. diameter, intermediate pressure cylinder of 24 in. diameter, and low pressure cylinder of 40 in. diameter, and a thirty inch stroke. The cylinders are of hard-grained cast iron, with the valve faces separate and bolted on. The crossheads are of wrought iron, with journals forged on, and gibs of cast iron, babbitted. The connecting rods are of wrought iron, and the line shaft is of wrought iron, 8½ in. diameter. The piston rods are of mild steel, 3½ in. diameter. The surface condenser forms a part of the framing, and has 950 square feet of cooling surface. Each engine has an independent cut-off, the connection of links to eccentric rods and to valve stem being adjustable, so that each link may be adjusted independently, and a steam reversing gear is provided, operated by a lever in the engine room. The screw is of cast iron, 10 ft. in diameter. The boiler is of the Scotch flue type, 13 ft. 6 in. diameter and 11 ft. 3 in. long, and is built for a working pressure of 156 lb. per square inch. The machinery is all strongly built and well finished. There is no extra work for ornamentation, but every part has the appearance of solidity, and is evidently intended to give a high degree of efficiency. Her indicated horse power on trial was 720. The design of the engines and arrangement of the cylinders, the high pressure being independent from the intermediate, is the design of James T. Boyd, constructing engineer of the Atlantic Works. The Triton is fitted with steam windlass forward and a gipsey aft, furnished by the American Ship Windlass Company, of Providence, R. I.



TRIPLE EXPANSION ENGINES FOR THE OCEAN TUG TRITON.

Manipulation of the Nasal Mucous Membrane.

Dr. Von Cederschiold has for some years employed a kind of manipulation, which he considers is of the nature of massage, in various affections of the nasal and pharyngeal mucous membrane. He first tried this kind of treatment on himself while suffering from chronic pharyngeal catarrh following diphtheria, and since then he has had opportunities of using it on a hundred cases in Stockholm. The instrument for the nares consists of a double spiral of silver wire about five inches in length, provided with a small wooden handle at one end and a loop or eye at the other. This loop serves to fasten one end of a strip of batiste—a material of which infants' frocks are made—which is wound round the spiral so as to cover it completely before the process is commenced. The instrument is gently introduced into the nostril, and moved to and fro. For the pharynx a sponge holder is used, carrying a pledget of cotton wool, which, as well as the metal parts, is carefully covered over with batiste. Gentle but rapid friction movements are made with this over the mucous membrane of the pharynx or naso-pharyngeal space. Not content with manipulating these regions, Dr. Von Cederschiold has actually invaded the interior of the Eustachian tube. For this purpose he employs a spiral similar to that used for the nares, but much finer, fine enough, that is to say, to be introduced into the tube through an ordinary Eustachian catheter.—*Lancet.*

Sixty Ruined Cities in Yucatan.

There are a few more than sixty ruined cities in Yucatan, so far as they have been discovered. Within a radius of one hundred miles from Merida are such magnificent examples as Mayapan, Ake, Chichen-Itza, Kabah, and Labna, but none is more interesting and grand than Uxmal, about seventy-six miles by road travel from Merida. By far the finest building in the city, both from its commanding position on a lofty eminence and the completeness of its preservation, is the Royal Palace, otherwise known as the Casa de Gobernador, in Spanish. It stands on the topmost of three terraces of earth—once, perhaps, faced with stone, but now crumbled, broken, and in a stage of heterogeneous decay. The lowermost and largest is 575 ft. long, the second 545 ft. long, 250 wide, and 25 ft. high, while the third and last is 360 ft. in length, 30 in breadth, and 19 in height, and supports the building, which has front of 322 ft., with a depth of only 39, and a height of but 25 ft. It is entirely of stone, without ornament to a height of about ten feet, where there is a wide cornice, above which the wall is a bewildering maze of sculpture. The roof was flat and once covered with cement, in the opinion of some travelers, but is now covered with tropical plants, trees, and verdure. There are three large doorways through the eastern wall, about eight feet square, giving entrance into a series of apartments, the largest of which is 60 ft. long and 27 deep, divided into two rooms by a thick wall. The ceiling of each room is a triangular arch, capped by flat blocks, at a height of 23 ft. above the floor. The latter, like the walls and jambs of the doorways, is of smooth-faced stones, that may once have been covered with cement.—*Philadelphia Telegraph.*

The Direct Production of Light.

In a paper contributed to the *Revista Maritima*, Signor Giulio Bertolini gives a summary of the remarkable experiments of Professor Hertz on electrical undulations, which were designed to verify the suggested identity of light waves with electrical oscillations of the ether. Faraday thought this might be true; and Maxwell was also led to conclude that electrical action is transmitted through space by means of oscillations of the same order as the luminous waves; the difference between the two phenomena depending only on the difference in the wave lengths. Prof. Hertz's experiments are now declared to have demonstrated: (1) That the medium which intervenes in the phenomena of electrical action is the same as that which is the seat of luminous phenomena; (2) that both species of perturbations are propagated under the same conditions, and with equal velocity; (3) that there is identity of nature between certain electrical and luminous phenomena. Moreover, it is stated that one of the greatest triumphs of Professor Hertz consists in having realized an arrangement whereby the length of the electrical wave is considerably diminished; thus approaching the character of the luminous wave, and shadowing forth a prospect of the direct industrial production of electric light. Indeed, different sources of artificial light can be compared by other than photometrical methods. Thus the lamps may be inclosed in an opaque calorimeter which measures the total energy of radiation, and again in a transparent calorimeter which permits the light radiations to escape. The energy represented by the latter will then be measured by the difference between the two calorimetric determinations. Experiment has given the following results for the ratio of duty of different luminous sources which can be measured in this way as light, the total radiations being taken as unity: Candle, 0·00298; petroleum lamp, 0·00315; gaslight (kind not stated), 0·00317; oil lamp, 0·00442; incandescent electric lamp, 0·06; arc lamp, 0·1. Thus the electric arc lamp, which gives the highest duty of all, wastes nine-tenths of its energy in non-luminous, invisible heat rays. If these rays could only be quickened, they would appear as light; and Professor Hertz is in hopes of being able to do something toward this end by manipulating alternating currents.

Miscellaneous Notes.

The earthquake in Northern California, on January 2, is reported by Prof. Holden, of the Lick Observatory, to have been the most severe experienced in that district since 1868. The ceilings of the observatory were cracked, the plaster falling to the floor. The large equatorial telescope is, however, believed to be uninjured.

The most northerly railroad on the globe is the new railway from Lulea in Sweden, on the Gulf of Bothnia, and Elvegaard in Norway, on the Atlantic, on the fiord of Ofenten, thus cutting the Arctic circle. The new railway will be opened next summer.

Resistance of the Air to a Locomotive.—Experiments on the French railways show that the resistance of the atmosphere to the motion of high speed trains amounts often to half the total resistance. Two engines, of which the resistance was measured separately and found to be 19·8 pounds per ton at 37 miles per hour, were coupled together and again tried. The resistance fell to 14·3 pounds per ton. The second engine was masked by the first. It may be argued from this that by a suitable adaptation of the front of a locomotive, electrical or otherwise, a saving of from 8 to 10 per cent of the effective power could be made.

Distilled Spirits Consumed in the Arts.

According to the new census report, prepared by Mr. Henry Bower and Mr. Henry Pemberton, Jr., the total quantity of distilled spirits consumed in the arts, manufactures, and medicine in the United States during the twelve months ending December 13, 1889, was 10,976,842 proof gallons.

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SERPOLLET'S STEAM CARRIAGE.

Mr. Serpollet's inexplosive generator was described by us at the time that it was presented to engineers and the public. As well known, it consists of a capillary metallic tube, in which water, when injected into it, is immediately converted into steam. This remarkable generator, which contains but a few cubic centimeters of water and no steam in reserve, seemed to us at the very outset admirably adapted for satisfying certain exigences, and especially those of the economical and practical propulsion of vehicles. After first operating a steam tricycle, Mr. Serpollet has within the last two years successively constructed experimental vehicles that have many times been operated at Paris, and that in January, 1889, permitted him, in company with Mr. Ernest Archdeacon, to make a long trip to Lyons. These preliminary studies led the inventor to devise an absolutely practical type that we propose to make known to our readers.

As shown in Fig. 1, the new carriage is handsome and luxurious. The work, moreover, was done by one of our best specialists. It has the form of a large phaeton, and is capable of seating seven passengers—three upon each seat and one upon a bracket seat opposite. Nothing of the comfort found in ordinary carriages is lacking in this. The suspension is easy and the seats are soft. In case of rain the hood in front can be put up, as in other phaetons.

The generator is concealed from view. It is situated in the rear between the two coal boxes, with which it is connected by two passageways, through which the fuel is fed automatically. The chimney is inverted. Another chimney, used only for firing up, is carried in a box. The water tank is placed under the seat to the left. The supply of water permits of making a trip of 30 kilometers, and the supply of fuel permits of a run of 60 kilometers. In cities the fuel to be preferred is coke, on account of the absence of smoke. The total weight of the carriage, charged with water and fuel, is 1,250 kilogrammes. It carries then 70 kilogrammes of fuel and 90 of water. The mean vaporization of the generator is 80 kilogrammes per hour. The consumption per horse and per hour does not exceed 14 kilogrammes.

The engine has two cylinders, the cranks are keyed at right angles, and the admission of steam is made at 65 per cent. The power, which is that of four horses, may momentarily attain that of six. The arrangement of the transmission is such that two speeds may be employed, one for gradients and the other for running on a level. With the latter, a speed of 25 kilometers per hour is obtained and maintained practically upon a good road. This speed it would be imprudent to exceed, or even at times to maintain. With the other speed, the carriage loaded with its seven passengers has ascended gradients of 8 centimeters per meter over heavy roads charged with pebbles.

Firing up is effected as in ordinary stoves, and in twenty minutes everything may be put in a state for a trip. The starting is effected by means of a hand pump. The water introduced into the generator instantly vaporizes, and the carriage begins to move. The feeding continues automatically. The steering handle serves also to regulate the speed. It is capable of making a rotary motion upon its axis and of opening and closing an orifice for the return of the water to the tank. It requires but one hand for the steering. As with stationary generators, stoppage is effected by cutting off the feed. The most sudden stoppage is effected through a brake with a pedal placed within reach of the driver's foot. No inspection apparatus is necessary, and it is, therefore, possible (as experience has demonstrated) to travel during the darkest night with a simple lamp for lighting the roadway.

The carriage is provided with a pressure gauge, which, without being necessary, gives some very interesting readings. It renders evident one of the great merits of the Serpollet generator, and that is its capability of reaching high pressures instantaneously and without danger.

If, on throwing the carriage into gear, it is in a tight place and a pressure of 10 atmospheres does not suffice to set it running, the injection is continued up to 15, 18, or 20 atmospheres if need be, and this rise of temperature takes place spontaneously at the very moment that it is necessary, and that, too, without danger. The Serpollet generators are tested to 100 atmospheres and are registered at 94. They are tested to 300 at the works before the test of the administration of mines.

There is another interesting point to be mentioned: According as the carriage is running on a level or up or down hill, the pressure, without one's having to occupy himself with the apparatus, remains stationary or descends or rises of itself, according as the motor meets with a greater or less resistance. The peculiarities of the Serpollet generator explain the facility with which a new effort may be given to the motor of the carriage in difficult passages, either for avoiding an impediment or for traversing a bad road. A simple supplementary injection with the hand pump suffices to obtain the desired effect. The pressure rises, the quantity of steam produced increases, and the new stress is exerted as if by a horse. No inspection is necessary on stopping, and no obstruction occurs in the generator, whatever be the quality of the water supplied to it.

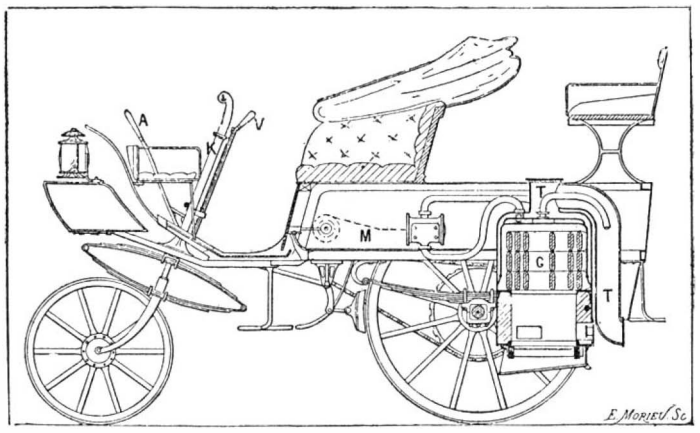

Fig. 2.—SECTION OF THE VEHICLE.

A. Starting lever. M. Two-cylinder engine. G. Inexplosive generator. T. Smoke pipe. V. Handle for change of speed. K. Steering handle.

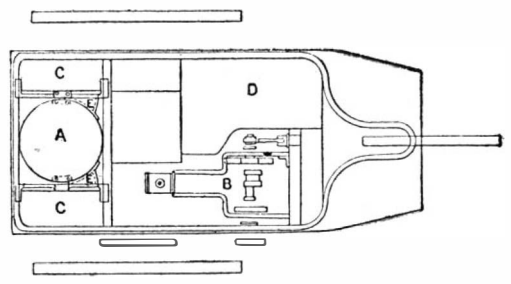

Fig. 3.—PLAN OF THE VEHICLE.

A. Generator. B. Motor. C C. Coal boxes. D. Water tank. E. Fuel feeders.

Mr. Serpollet's steam carriages have been authorized by the prefecture of police to be run freely in Paris, with a single restriction, and that is, they must not exceed a speed of 16 kilometers per hour.

Mr. Serpollet was kind enough recently to offer us a seat in his first steam carriage. After taking us to the Bois, he brought us back to Paris through the Champs Elysees and the great boulevards, running his vehicle amid carriages and crowds with remarkable precision.

It seems to us that a great progress is here realized and an important problem solved.—*La Nature.*

Fig. 1.—SERPOLLET'S STEAM PHAETON.

Humming Bird Notes.

These little sunbeams of birds, as the Western Indians called them, are only found in North and South America and the islands adjacent. They are more thickly distributed in the equatorial section, and are there known as "sun birds." The peculiar and often beautiful formation, and the iridescent coloration of their plumage, are characteristics that excite the wonder and admiration of all observers, naturalists and laymen. The long-tailed humming bird of Jamaica (*Trochilus polytmus*) is more transcendent in beauty of form and color than the celebrated emerald paradise bird of New Guinea.

Some species range north to the Arctic regions and south to Patagonia, and from the level of the sea to the cold heights of the Andes, but, wherever found, the hues of emerald and ruby, and amethyst and topaz, flash from their beautiful forms. Everything in their organization contributes to give them great power and rapidity of flight, and they are able to balance themselves in the air or beside a flower with a facility which finds a parallel only among some of the insects. The bill is awl-shaped, thin, sharp-pointed, straight or curved. The tongue, which is split almost to its base, forming two hollow threads, can be protruded at will, and, while their main food is assuredly the distilled juice of flowers, they will not live when deprived entirely of insect food.

There are about 400 species of humming birds, but only six or seven are native to the United States. Among the most prominent species, esteemed for the singular formation and color of their plumage, we find, first, the "long-tailed" humming bird, which is found only in Jamaica. The upper part of this beautiful creature is of a green color, glossed with gold; the wings are purple brown, and the tail, nearly three times longer than the body, is black, with a steel-blue reflection. Its length, including the tail, is about ten inches. Another remarkable species, not especially brilliant in plumage, is the "sword-bill," with a beak nearly as long as the rest of its body. The copper-bellied, puff-leg humming birds have a tuft of pure white, downy feathers, which envelop each leg, hence its name. The "white-booted racket-tail" is another brilliant, and is noted for its remarkable swiftness of flight, darting like an arrow through the air. Many other species are deeply interesting, and their names also will suggest the brilliancy of their coloration. We name a few: Little flame-bearer, Princess Helena's coquette, the snow-cap, spangled coquette, the ruby, topaz, blue-tailed sylph, Cayenne fairy, and many others with characteristic names and beauty.

While in their daring flight some of the wading birds cleave their way through the clouds and sweep a whole hemisphere, a little family of humming birds have only a rose bush for their universe. Like an elegant vase ornamented with lichens, a downy nest of cotton is balanced on the extremity of the most slender branch of the plant, while these aerial diamonds make prey of the insects which the flowers attract, or drink the pearls of dew which their petals distill. Such, Pouchet tells us, is the life of the sparkling-tailed humming bird. In the same manner, according to Gould, the "emeralds of Brazil," as they are commonly called, robed in changing green, set up their family nests upon the slender, pendent stems of the creepers, from the vicinity of which they never move. Rocked by the zephyr, the female broods tranquilly on her eggs, while her lord flits amorously near her; here are spent all the happy days of the gentle pair. —*Nature's Realm.*

Earthquake Photography.

We learn from the *Revista Scientifico Industriale* that Signor Baratta's device is briefly this: The telephone wire is connected with a subterranean microphone. Before the telephone diaphragm (vertical), and connected with its center by a fine aluminum wire, is a short slip of the same metal, fixed below, and having a curved piece at the top, which rests against a small mirror, movable about a horizontal axis. This mirror reflects the light from a lamp and lens to photographic paper on a rotated drum. The light is momentarily shut off every quarter of an hour by a shutter arrangement, worked electro-magnetically by the clockwork which moves the drum.

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Astronomical Expedition to Peru.

Professor William H. Pickering sailed from New York for Arequipa, Peru, on December 20, accompanied by Mr. A. E. Douglas and Mr. R. D. Vickers, who will assist him in his astronomical work. The Harvard College Observatory has, until recently, occupied a station on Mount Harvard, near Chosica, in Peru, where, under the direction of the Messrs. Bailey, photographs of the southern heavens have been obtained with the Bache photographic telescope, aperture 8 inches, focal length 44 inches. Measures of the light of the bright and faint stars have also been made with the meridian photometer. These measures will furnish the material for determining the magnitudes of the southern stars brighter than the magnitude 6·3, and thus extending the "Harvard Photometry" to the south pole. Measures have also been obtained of stars of the ninth magnitude and brighter, distributed in zones similar to those recently published in Vol. XXIV. of the H. C. O. Annals. In consequence of the long duration of the rainy season at Mount Harvard, the instruments have been removed to Arequipa, which has an elevation of about 8,000 feet above the sea level, where a station has been established. There, under the direction of Professor W. H. Pickering, the photometric observations will be completed and the work of the Bache telescope continued and extended. The plan of work for this instrument is to cover the sky from —20° to the south pole, first with chart plates having 10 minutes' exposure, second with chart plates having 60 minutes' exposure, third with spectrum plates having 10 minutes' exposure, and fourth with spectrum plates having 60 minutes' exposure. Each of these researches will cover the sky twice, so that at least eight photographs of every bright star will be obtained.

It is further proposed that, while the instrument remains in Peru, the first of this series of plates be repeated each year, in order to furnish a means of determining and discussing the variability of large proper motion in the stars. Professor Pickering has taken with him the Boyden photographic telescope, aperture 13 inches, which, until lately, has been employed in photographing the objects of interest in the heavens which could be advantageously obtained at the station on Wilson's peak in southern California. With this instrument he will continue to photograph the moon, planets, double stars, clusters, and nebulæ. In addition to this, by placing a prism over the object glass, the spectra of the brighter southern stars will be obtained with this instrument, on a scale which will render the photographs comparable with those of the northern stars obtained with the 11 inch Draper telescope at Cambridge, thus extending this important investigation also from pole to pole. A meteorological station will be attached to the observatory at Arequipa, which will furnish interesting records of atmospheric conditions prevailing at this elevation. The series of meteorological observations at Viconcaya, elevation 14,600 feet, at Puno, elevation 12,500 feet, and at Mollendo, near the sea level, will also be continued. The Messrs. Bailey, who at present have charge of the observing station at Arequipa, will probably return to Cambridge in April, bringing with them the meridian photometer.—*Sidereal Messenger.*

The Del Norte Well.

It is an artesian well with an abundant flow of pure water, sufficient to irrigate a considerable body of land. That would be enough for any one but a San Luis man, but this is mineral water. It is effervescent, very palatable and extremely healthful. Nor is this all; the force of the water brings up from the depths an occasional lump of native silver or a gold nugget. The frugal farmer has placed a sack of wire netting over the mouth of the well to catch the metal and prevent it from choking the cows. Local scientists claim that at a great distance down and under an enormous pressure the water is washing away a ledge of rock whose softer parts go into solution and give the water its mineral qualities, but whose gold and silver, not being dissolved, are brought to the surface in a metallic state.—*Pike's Peak Herald.*

Polychromine.

Polychromine is the name given to primuline by a Swiss manufacturer. He has found that the diazo compound of this body is but slowly decomposed by boiling with acids, and the product has no technical value, but that when boiled with alkalies it is quickly altered and a product is formed which has some technical value. The reaction is carried out as follows: 50 lb. of polychromine are dissolved in 100 gal. of water, mixed with 30 lb. hydrochloric acid 30° Tw., and diazotized by adding 7 lb. nitrate of soda; then 30 lb. ammonia at 25 Be. are added; the mixture is allowed to stand for about twelve hours, after which it is boiled, when the new coloring matter forms. It is separated out in the usual way. It dyes unmordanted cotton a gold yellow, which is turned red by caustic alkalies; like the original color, it can be diazotized on the fiber to form new shades.

Soda Lake.

A brief description of the interesting region of San Bernardino County, Cal., cannot fail to be of interest. There is a tradition among the Piute Indians to the effect that during the time of their forefathers what is now Soda Lake was at that time a vast sheet of water 20 miles long and 8 wide, which must have been fresh, as the legend says the waters teemed with fish. It is situated 500 feet above the level of the sea. There are times when this great natural reservoir is filled to the brim, particularly when heavy cloudbursts occur on the slopes of the neighboring mountains, and the waters rush in torrents down into the basin. Then the subterranean channel or outlet is flushed and found too small to carry off the flood. So great is the pressure that the lake bed becomes a veritable geyser, spouting mud and water violently.

On the southwest side of the lake is a considerable area covered by sand dunes, which region has been named in grim humor the Devil's Playground or Hell's Half Acre. During the wind storms which frequent this section, millions of tons of sand are shifted in a great circle about 12 miles in diameter from one side of the lake to the other, the central portion of the area remaining seemingly undisturbed, covered by a snowy white crystallization of soda.

Along the west side of the lake for a distance of four miles occur springs of pure water which flow down to the lake's margin, where the greedy sands swallow up the streams. The largest spring flows from a fissure in the solid blue limestone which forms the bedrock of the region. The water from this spring flows about 18 miles before it is lost in the desert sand. There are numerous other springs on the southeast side of the lake.

Soda Lake station is situated about 75 miles east of Daggett on the line of the old emigrant road from Salt Lake. Its mean temperature is about 80 degrees. To the northward, a deep, rugged canyon has been cut down into the limestone. Passing through this canyon we come to another dry basin, known as Crystal Lake. In size its area is 60 miles, 12 long by 5 wide. This basin is filled at times, though rarely, by the overflow from the Mojave River.

Making our way through another pass for a distance of 12 miles, we reach the confluence of the Mojave and Amargosa rivers, where a spur of the Ivanatz Mountains forms one of the river banks. On the westerly slope of this range occur the salt spring and Amargosa mine, which were discovered by John A. Golden in 1849, while on his way from St. Louis, Mo., with an emigrant train. It was this same train which divided at King's Springs in Nevada. It was from this circumstance that the sensational stories arose which have recently been published giving lengthy descriptions of the terrible sufferings and ultimate death of a hundred or more men, women and children in Death Valley while endeavoring to cross the desert. The loss of life, though not near so great as reported, occurred with that portion of the train which Mr. Golden left. After leaving the main train in Nevada, he started with his own outfit for Los Angeles, California. Traveling down the Amargosa River, he camped one day at Salt Spring, and it was while here that he made his way up the mountain side and found a piece of heavy black mineral.

Not being familiar with it, but thinking it might possibly have value, he took it with him to camp, eventually taking it to Los Angeles, where he showed it to a number of gentlemen, who at once unhesitatingly pronounced it gold, covered with a black oxide of iron. He was offered $5,000 to guide a party to his discovery, to which he consented, though it was with the distinct understanding that should he fail to show them his treasure trove, or in the event of his becoming lost on the desert, his life should pay the forfeit. Mr. Golden readily consented, for he had every confidence in being able to guide his party directly to the spot.

A party was promptly formed and left Los Angeles to face the dangers of a reported unknown and terrible desert in search of the golden treasure. The hardy pioneer had no difficulty in finding Salt Springs, and went into camp at that place in high spirits; but his satisfaction at having reached his journey's end was soon turned to consternation when he was unable to find the place at which he had discovered the gold. He tried to keep the dreadful fact from his companions for a time, but they were after gold, and soon became so importunate that he was obliged to confess his inability to find the place again, though the while earnestly protesting his good faith. His copartners felt themselves duped, and angrily recalled the unfortunate man to the terms of the contract, coolly informing him that if he had any prayers to say it was time to commence.

In an agony of despair, though believing the place must be near, he sank on the ground and buried his face in his hands. One of the party approached and stood glaring at him, when casually glancing on the ground at the doomed man's feet, he saw a piece of mineral similar to that exhibited by Mr. Golden in Los Angeles. The mine was located, the party then returning to Los Angeles, where Mr. Golden was paid his $5,000. A corporation known as the Salt Springs Mining Company was formed, and in 1852 a five-stamp mill was erected and kept in operation continuously during the following winter seasons until January, 1864, at which time the Piute Indians, who were on the warpath, massacred every one at the mine, burned the mill and sacked the camp.

After the burning of the mill, Mexicans secured leases on the property and worked the ore in arastras, realizing, it is said, fabulous sums.

Undoubtedly the mine was of a pockety character, as it was afterward abandoned for years and relocated a number of times. In 1880, under the management of C. A. Luckhardt, of San Francisco, the concern was reorganized and listed on the New York Stock Exchange, where the stock sold as high as $15 a share. But little work of development was done at the mine and the entire scheme soon fell through, the mine finally becoming the property of J. B. Osborne, of Daggett, the present owner.

The water of Salt Springs contains about the same percentage of chloride of sodium as that of the sea. The altitude is about 800 feet above sea level, and it is situated about 60 miles directly northeast of Daggett. At 1 P. M. May 2, 1890, the temperature was 88° in the shade.

The many stories of fabulous discoveries in the desert regions are to a great extent apocryphal, and have no foundation in fact. Every mining district has its lost cabin; the desert region its Breyfogle, Lee, Gunsight, Pegleg, and other fakes, on the rediscovery of which both life and money to a considerable amount have been lost without any good results.

My authority for the above version of the golden discovery and ultimate result is Mr. M. Marsh, one of the earliest pioneers of our State and county, and an inhabitant of the desert region for many years.—*Mining and Scientific Press.*

Cannon Ball Photography.

In our number for January 17 we published an engraving of what purported to be a photograph of a shell in flight as fired from an 8 inch mortar, taken on the grounds of the Michigan Military Academy, Orchard Lake, Mich. The photograph was sent to us by J. Sumner Rogers, colonel and superintendent of the academy, who stated it was an instantaneous photograph taken during practice firing under the command of Lieut. Frederick S. Strong, U. S. A.

Thereafter we received the following:

To the Editor of the Scientific American:

I notice in your issue of Jan. 17, 1891, a photomechanical print from an original negative of a cannon ball in motion. If I remember correctly, the experimenters in Hungary, in investigating projectiles in motion, used a shutter speed of 0·0000076 of a second, and then found the ball had moved visibly during the exposure. Now I wish to state that at any time of day when a shadow as long as that cast by the figure in the foreground of this picture occurs, and with a lens stopped down enough to give a sharp outline of the distant woods and also of the adjacent officer, and a shutter speed sufficient to get the ball at all, such a fully exposed and graded photograph is an impossibility; in fact, I should say that anything more than the faintest outline of the highest lights could never be developed.

HENRY N. POTTER,
Photographic Instructor Natural Science Camp,
Canandaigua Lake, N. Y.

Amherst, Mass., January, 1891.

We submitted the above letter to Col. Rogers, who in reply informs us he believed the picture to be genuine, but now finds he foolishly allowed himself to be deceived by a dishonest photographer, who "intensified" the ball so as to make it show in the picture. The Colonel regrets, etc.

Preserving Timber for Piles.

Mr. E. A. Wallberg, in an article on the preservation of timber in the *Transit*, is authority for the statement that whatever preservative is to be applied, the timber for piles subjected to the action of sea worms should first be charred, so as to kill any germs near the surface, open the pores of the wood for the antiseptic, and destroy the nutritive upon which the worm lives while beginning its action. The perfectly sound condition of the piles in the Charleston wharves after seven years of exposure proves the efficacy of this process, since untreated piles in those waters are eaten entirely through in less than two years. The Nicaragua Canal Construction Company also has given orders to char all the piles to be used in the Greytown harbor work.

SOME nickel-steel plates recently tested at the Carnegie works, the specimens being cut from a three-fourths inch plate, gave excellent results. The elastic limit is said to have been 59,000 to 60,000 pounds, and the ultimate strength 100,000 and 102,000 pounds. The reduction of area was 29½ per cent and 26½ per cent respectively.

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Concerning Memory.

History furnishes us with a large number of examples of wonderful memory.

Scaliger, an Italian, in twenty-one days committed to memory the Iliad, which comprises 15,210 verses, and the Odyssey, which also comprises a large number; Lipsius, a professor at the University of Leyden, offered to recite Tacitus' history in its entirety in the presence of a person armed with a poignard, who should stab him with it at the first error; Louis XIII., after a year's time, could draw, from memory, the plan of a country with all its details; and the actor Lassaussiclere, after reading advertising sheets for an hour, could repeat them textually, and this, it may be said, by way of parenthesis, must have been pretty wearisome. It is stated also that an Englishman who had an extraordinary memory was introduced to Frederick at Potsdam, and on the same day Voltaire having brought some verses to the king, the latter had the Englishman concealed and requested Voltaire to read his work. "But these verses are not yours," said the king, "they were recited to me this morning." He then produced the Englishman, who, to the great astonishment of Voltaire, recited them without error.

It is especially in the legendary stories of antiquity that we find numerous examples of extraordinary memory. Let us recall the fact that to Adrian the successor of Trajan, to Mithridates, to Themistocles, to Scipio, to Cyrus, and to many others, is attributed the faculty of remembering the names of all their soldiers; that it is claimed that Hortensius the orator attended a public sale lasting a whole day and recalled, in order, all the objects sold and the names of the purchasers; and that the ambassador Cineas, having been received in the senate, saluted by name, on the following day, all the senators, whom he had seen but once. These numerous examples from antiquity are easily explained. In fact, before the dissemination of the art of writing, the development of the memory was indispensable. In our day, this faculty is less cultivated, at least for ordinary requirements, since, by means of notes, we can almost dispense with it. Yet there is a memory that every one possesses and that many persons are ignorant of, and that is the memory of the eye, the memory of things seen, that of the artist and the draughtsman—the faculty that permits the latter to reproduce an ornament, for example, that they have seen but once. This memory is possessed by every one in a greater or less state of development, for every one sees, and to a greater or less extent classifies in his brain the things seen, and that too without being conscious of it. It is this memory of the eye that forms an excellent mnemotechnical method. The following are a few examples. Many soldiers, in order to recall theory, endeavor to figure to themselves the page *recto verso* and then the place on the page where the article that they wish to recall is found. Certain prestidigitators employ the same method for indicating in a book the page and line containing a citation that is made to them. Others, after having had repeated to them any forty common names, at once repeat them in order, either by commencing at the beginning or the end, or at random, in assigning to each of them the number of the order in which it has been given. An author of the 16th century named Muret tells that he once saw a Corsican to whom he dictated two thousand Latin, Greek, and barbarous words having no affinity with each other, and who repeated them to him in order. This appears to us doubtful, for it is pretty difficult to memorize and repeat forty words only, and requires a well drilled memory. Yet with the memory of the eye we can quickly reach the same result, not with forty, but with twenty names, for the difficulty increases in proportion to the number of words added. It is necessary to proceed as follows: Let us suppose that the first name given is "mouse;" do not attempt to recall the word, but consider your memory as a sensitized photographic plate—in a word, make a negative of the object, see before your eyes the animal itself walking slowly and carrying a placard marked No. 1. Let us take "hat" for the second name. Imagine a hat with the number 2 fixed above, as upon the hat of a conscript. For No. 3 let us suppose "chair." Imagine a chair provided with a number showing its price as marked by the dealer, etc. You will then easily recall the succession of the objects and the number of their order and will be able to name them in every way possible. Proceed in this manner up to ten, and then the next day up to twelve, and so on, gradually increasing the number. After a few repetitions of this exercise, you will be astonished at the ease with which you will succeed in retaining twenty or more words, absolutely classified in your mind as if on drawing paper, so that when you are asked the number the name will come to your mind, and reciprocally. This is a pleasing diversion for family reunions on long winter evenings.—*M. Alber, prestidigitator, in La Nature.*

A VERY extensive domestic industry in Russia consists of the manufacture of wooden spoons, which are made to the amount of 30,000,000 annually. They are nearly all made of birch.

CENTRIFUGAL ACTION OF AIR.

BY GEO. M. HOPKINS.

That air has sufficient mass to enable it when set in motion to do work is shown by every whirlwind, by

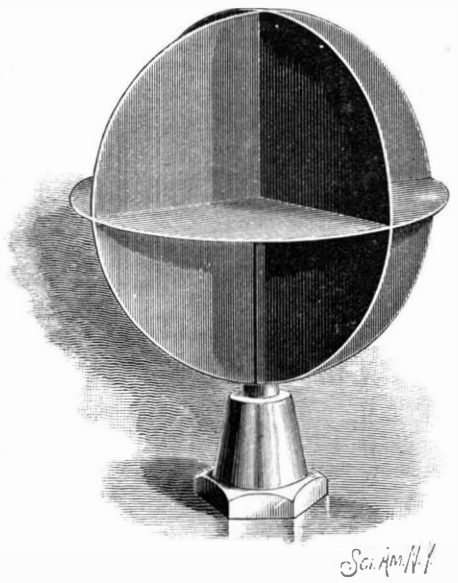

Fig. 1.—THE "SKELETON SPHERE."

the action of the windmill, by the sailing of vessels, and in other ways. The grandest example of the centrifugal action of air is furnished by some of the movements of the entire atmospheric envelope of the earth; the upward currents at and in the vicinity of the equator, the downward movement of the air at the poles, and the winds blowing along the earth's surface from the poles toward the equator are due in part at least to centrifugal force. Any body revolving in air furnishes a partial illustration of this principle, the defect in the illustration being the absence of a force to

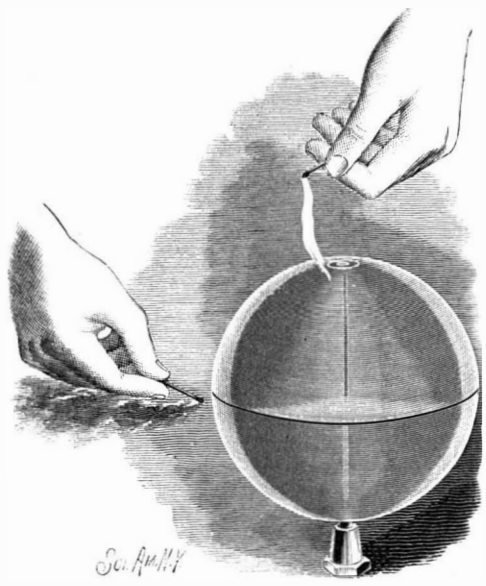

Fig. 2.—AIR CURRENTS SHOWN BY FLAME AND SMOKE.

hold the same body of air always in contact with the revolving body.

A very simple and effective piece of apparatus applied to the whirling table for showing the effect of centrifugal force on air was described some time since in a foreign scientific journal. The writer has applied this apparatus to the scientific top (already described in these columns), in the manner fully illustrated by Fig. 1. The construction of the attachment is shown in Fig. 2, and Fig. 3 shows the direction of the air currents.

The apparatus consists of a metal tube loosely fitted

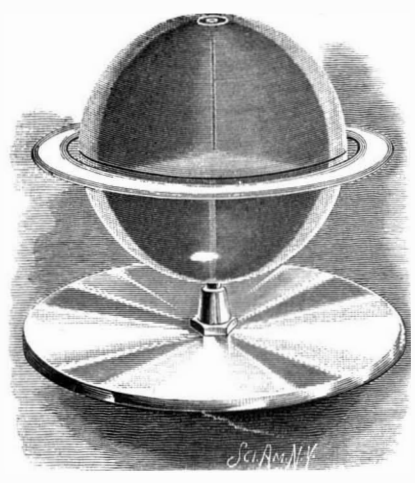

Fig. 3.—PAPER RING SUPPORTED BY AIR.

to the stem of the top and provided at its upper end with a tin disk four inches in diameter, with four quadrants of the same material attached to the disk and tube below the disk and a similar arrangement of quadrants above the disk, thus practically forming a skeleton sphere—if such an expression may be used—of two vertical circular disks intersecting each other at the axis of rotation, these two disks being intersected at the equator by another at right angles to the axis.

The top being in rapid motion, the apparatus is placed upon the stem, and being revolved at the same rate as the top, it throws out air at the equator which is continually replaced by air drawn in at the poles. The direction of the air currents is clearly shown by holding a lighted wax taper near the apparatus at the poles, and at the equator, as shown in Fig. 2, or by creating a smoke in the vicinity of the top.

A paper ring, ½ inch or ¾ inch wide, and ¼ inch larger in internal diameter than the sphere, is supported by the outrushing air, in a plane nearly coinciding with the equator. If displaced and released, it immediately returns to its original position.

Professor W. C. Peckham, of Brooklyn, who has been experimenting with a large sphere of this kind, thinks that the trade winds could be fairly illustrated by the apparatus, provided it could be inclosed, so as to cause the same body of air to circulate continually from pole to equator, and in the reverse direction.

Inoculation by Mosquitoes against Yellow Fever.

Drs. Finlay and Delgado, of Havana, have published in the *Revista de Ciencias Medicas* some statistics of their practice of inoculating persons newly arrived in Cuba against yellow fever by means of mosquitoes which have been caused to contaminate themselves by stinging a yellow fever patient. These observations have been carried on for the last ten years, and, in addition to a certain number which are still incomplete, may be said to consist of fifty-two cases of mosquito inoculation which have been fully followed up.

Of these, twelve experienced between the fourth and the twenty-sixth day after inoculation a mild attack of yellow fever, with or without albuminuria; twelve experienced no symptoms of yellow fever either within twenty-five days after the inoculation or during three years subsequently; twenty-four experienced no symptoms within twenty-five days, but contracted a mild attack before the end of three years, either uncomplicated by albuminuria altogether or with only a very transient appearance of it; three who had had no symptoms within twenty-five days contracted well marked yellow fever within three years; one patient who had a mild attack in consequence of inoculation contracted a severe attack later on, which proved fatal; that is to say, that of those who had been inoculated, only about 8 per cent contracted the disease in a well marked form, with a mortality of under 2 per cent. In order to enable us to appreciate the significance of these figures, the authors mention that they observed sixty-five monks who from time to time arrived in Havana, where they all lived under similar conditions. Thirty-three of these were inoculated, and thirty-two were not. Only two of the inoculated contracted well marked attacks, which, however, did not prove fatal, whereas eleven of those that had not been inoculated were severely attacked, no less than five dying. It is remarked that inoculations performed in the cold weather are not entirely trustworthy, and that they should be followed up by a repetition in the spring, also that experience shows that a person who has been three years in the city without contracting the disease has become "acclimatized," and is very unlikely to be attacked at a subsequent period.—*Lancet.*

Prizes for Road Photographs.

To stimulate the collection of photographs to be used in showing the need of improved roads in the United States, the New York and Connecticut divisions of the League of American Wheelmen offer prizes aggregating one hundred dollars for the best collections of photographs of such subjects as most strongly illustrate the unfitness of the present public roads (especially the common "dirt" roads) to be used as public highways, including photographs showing the common spectacle of the farmer's team or the merchant with his loaded wagon vainly trying to drive his patient team and load out of the inevitable mud hole, and other pictures illustrating the goodness of good roads and the badness of bad roads—the proper thing in this line.

Each photograph must be accompanied by a full statement of particulars, giving date, location, etc., by which the picture may be identified. The competition will close on the first day of May, 1891.

THE Smithsonian Institution has just published the first bulletin of the United States Board on Geographical Names. The board was organized in April, 1890, for the purpose of removing a growing evil in the government publications. There was a difference in orthography and nomenclature in the different bureaus charged with publication, and even a lack of harmony in those of a single bureau. The new board received the formal sanction of the government by an executive order dated September 4, 1890. Lieut. R. Clover, Hydrographic Office, Navy Department, is the secretary, to whom all communications should be addressed.

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RECENTLY PATENTED INVENTIONS.

Engineering.

SCREW PROPELLER. — Benjamin F. and Millard F. Sparr, New York City. According to this invention there are arranged upon the propeller shaft a series of spiral and tapering blades, with larger auxiliary blades at the rear end, whereby it is designed to increase the speed of a vessel, while the improvement can be applied without materially changing present forms of construction.

BLAST FURNACE HOPPER.—Benjamin F. Conner, Columbia, Pa. Combined with the hopper are two bells, an inner bell mounted to turn within an outer one, openings of the two bells registering with each other, and means for operating both bells and rotating the inner one, to facilitate the distribution of the charge within the furnace as desired.

Mechanical.

SAW FILING AND SETTING MACHINE. —William H. Parry, New York City. Combined with a pivoted guideway and a slide carrying a file holder is a vertically adjustable friction roller engaging the guide, the roller being carried by a lever which is given a swinging motion by a cam, with other novel features, whereby the saw is accurately fed and the teeth made uniform, the invention being an improvement on a former patented invention of the same inventor.

DIE FOR ORNAMENTAL WORK. — William Schumacher, Brooklyn, N. Y. This is a die for ornamenting cardboard, leather, or similar material, and is composed of a suitable body of metal, rubber, celluloid, or other substance, formed with apertures in which are fitted glass projections of any desired form, these projections being polished and covered with gold, silver, etc., to form the lining of a socket made in the material when the die is pressed therein.

WINDMILL. — William Palmer, Jr., Rincon, New Mexico. The construction of this wheel is such that as the wind increases it adjusts a crank pin operating a reciprocating pitman to give an increased resistance, and thus accomplish more work, while preventing the wheel from moving at a dangerous speed, the regulation of the speed being thus automatically effected.

TICKET PRINTING MACHINE.—Gideon B. Massey, Mamaroneck, N. Y. (deceased, Sarah R. Massey and Stanley A. Bryant, administrators). This invention provides a machine to print a ticket from one station to any other station on a road, and at the same time date and consecutively number all tickets issued, and keep a record thereof, the invention covering a novel construction and arrangement of parts and combinations of elements.

Agricultural.

CULTIVATOR ATTACHMENT. — Edward S. Bailey and James M. Coons, Orrick, Mo. A shoe is pivoted to the end of the plow standard, and a peculiarly constructed spring is adapted to bear upon the upper end of the shoe and hold it in place, the shovel or plow being secured to the lower end of the shoe, the improvement being designed to prevent accidents to the plow from the striking of rocks, roots and other obstructions.

PLANTER AND FERTILIZER DISTRIBUTER.—Washington S. Jones, Meridian, Miss. This is a box-like reservoir which may be conveniently attached to any plow stock, with a rearwardly and downwardly curved spout, and a stirrer and feeding device, with means for operating the latter from the supporting wheel, while the seed dropped are covered by blades at the rear of the spout.

Miscellaneous.

BREECH LOADING GUN. — Julian Warnant, Creon, Hoignee-Cheratte, Belgium. This gun has a movable breech block with cartridge-receiving aperture, in which slides a bolt to throw the cartridge and form an abutment, a pivoted locking bar engaging the bolt, which also carries a firing pin, the invention embracing other novel features, and the gun being self-loading and self-cocking, and automatically ejecting the empty shell.

VENTILATING APPARATUS.—George H. Burrows, Somerville, Mass. This invention provides an expansible air tank or reservoir constructed on the principle of a gasometer, in connection with an air supply pipe and pump to draw air from an elevation or other desired point, and a delivery pipe connected with the rooms to be ventilated and adapted to pass the air through a heater if desired.

DREDGER. — Hugo Roessler, Erbach-on-the-Rhine, Germany. The vessel carrying this apparatus has offsets on opposite sides, near which are arranged centrifugal pumps provided with suction and delivery pipes, prolonged pipes having a ball and socket connection with the delivery pipes, for removing sand and similar deposits at the bottom of a river or harbor by directing a powerful stream against the material to be removed.

FENDER FOR VESSELS. — Gustave O. Stein, Pioche, Nevada. The bow or cutwater of the vessel is, by this invention, provided with one or more vertical rollers, hung in a frame supported by horizontal arms, whereby the rollers will be canted and tilted in one direction or the other and roll along the sides of a vessel against which they may strike, without doing damage.

DRILLING MACHINE.—Thomas Stanley, Pueblo, Col. Combined with the framing, operating mechanism and drill rope, are levers which support a hanger for the drill devices, and ropes connecting the outer ends of the levers with the operating mechanism, the invention covering a novel construction and arrangement of parts for a machine designed to drill wells or to dig post holes, etc.

BOTTLE FILLING APPARATUS. — Amalia M. Donally, New York City. This invention covers a novel construction and combination of parts in a device whereby bottles may be conveniently and expeditiously filled from a storage tank, keg, etc., while the arrangement is such that the liquid so conveyed to the bottles will be prevented from foaming.

BARREL WASHER. — George A. Bidwell, Pittsfield, Mass. A hollow rotating shaft is adapted for connection at one end with a steam and water supply, its other end being formed as a support for the barrel, while a branch pipe leading from the shaft is adapted to discharge into the barrel, and an adjustable support for the barrel is arranged in line with the shaft.

GRATE SUPPORT. — Charles L. Beers, Scranton, Pa. This is a support for the grates of cooking stoves, furnaces, boilers, etc., designed to be simple and inexpensive in construction, and to be readily attached to or detached from the fire pot, the supporting frames being of such form that they may be cast in the ordinary moulds now in use.

VEHICLE SEAT.—Thomas J. Kerstetter, East Brady, Pa. This invention covers a seat-back support formed from a rod of spring metal bent to form the base part, the side rail, the portion connected with the back, and the upright brace arranged to brace the portion which connects with the back bar, the seat and back bar being of any suitable construction, and the supports being sufficiently yielding to conduce to the comfort of riding.

CLOTHES HANGER. — Emil Sundberg, Eureka, Cal. This is a device of such construction that all the clothes hung thereon may be quickly removed, consisting of a simple and inexpensive rack of novel form, whereby, when the clothes are withdrawn from the rack, they will form into a bundle which may be thrown over the shoulder and conveniently carried.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

SCIENTIFIC AMERICAN

BUILDING EDITION.

FEBRUARY NUMBER.—(No. 64.)

TABLE OF CONTENTS.

1. Handsome plate in colors of an elegant residence on Chestnut Hill, Mt. Vernon, New York, erected at a cost of $12,000 complete. Two perspective views, floor plans, etc.
2. Colored plate representing an attractive residence at Auburn Park, Chicago. Cost $7,000. Floor plans, perspective elevation, etc.
3. Plans and perspective view of a carriage house erected at South Orange, N. J., at a cost of $2,700 complete. H. H. Holly, Esq., architect, New York.
4. A residence at South Orange, N. J. Cost $11,000 complete. Perspective elevation, floor plans, etc. Architect, H. H. Holly, New York.
5. Handsome residence of Gothic design at Germantown, Pa., erected for Mr. B. P. Wilson. Perspective elevation and two floor plans.
6. Cottage in Sophia Avenue, Chicago, estimated cost $2,800. Floor plans and perspective elevation.
7. Perspective elevation and floor plans of a recently erected cottage at Stratford, Conn. Cost $2,700 complete.
8. A colonial residence erected at South Orange, N. J., from plans by Rositter & Wright, architects, New York. Cost $17,000 complete. Perspective elevation and two floor plans.
9. Cottage at Austin, Chicago. Estimated cost $3,700. Floor plans, perspective view, etc.
10. Floor plans and perspective view of an elegant cottage at Austin, Chicago. Cost about $5,000.
11. A corner of a boudoir, designed by J. Armstrong Stenhouse. Half page illustration from a colored drawing, which appeared in the Royal Academy exhibition last year.
12. A picturesque cottage of moderate cost at Austin, Chicago. Two floor plans and perspective elevation. Estimated cost $900.
13. Miscellaneous contents: Jarrah wood.—Biographical sketch of Henry Schliemann, the archæologist. —Bronze castings.—The SCIENTIFIC AMERICAN a help to builders.—American stone fields.—How can iron pulleys be papered?—England's favorite hard woods.—Floors.—Plaster.—Developments of construction.—Corrosion of zinc in contact with brick.—Etching upon glass.—Magnesia in cement. —Our last year's volume.—Improved woodworking machinery, illustrated.—A novel calendar, made of tin.—Broughton self-closing basin cock, illustrated.—The Edson recording pressure gauge. —A new gasoline engine, illustrated.—Universal file handle, illustrated.—The Dunning hot water heater.—Improved conduits for electric wires, illustrated. — A thoroughly built parlor door hanger, illustrated. — California fruit.—Labor-saving appliances for the carpenter and builder, illustrated.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(2832) H. A. B. asks for a liquid stove polish. A. Mix 2 parts copperas, 1 part dry boneblack or drop black, 1 part black lead, with enough water to form a creamy paste. Apply with a dauber. The bone black must be finely ground, and the purer the black lead, the better.

(2833) J. J. L. asks how many grains are intended for one ounce used in photographic formulas? I notice some state particularly 437½ grains to one oz., while others do not mention it. Is 480 grains intended when not otherwise stated? A. Yes; 437½ grains is the standard commercial ounce avoirdupois, at which photographic chemicals are sold by manufacturers. When the number of grains is not mentioned, 480 should be used, which is the troy ounce.

(2834) W. O. D. asks: What can be mixed with plaster of Paris in order to make it harden slowly? A. Three to ten per cent of powdered marshmallow root.

(2835) A. W. R. asks for a recipe for an ink with which to write and draw on glass for lantern slides. A. Use very thick India ink. Also see query No. 2704

(2836) L. L. B. asks: 1. What is the best receipt for laying down eggs from June till December? A. Dipping an instant into melted lard or paraffin, or oiling with linseed oil followed by packing in oats or bran, is recommended. Or make a pickle of 1 bushel of lime, 8 quarts salt, 250 quarts of water. Immerse eggs in it, constantly stirring as they are inserted. 2. What is the best receipt for any person to do up fine shirts and collars, that will polish well and not be yellow when done? A. For laundry work we refer you to our SUPPLEMENT, No. 577, and to the SCIENTIFIC AMERICAN, No. 9, vol. 61. 3. What is the nearest point to the north pole that has been attained by any one yet? A. The highest northerly latitude was reached by Lieut. Lockwood and Sergeant Brainard, in 1883. It was on the northern coast of Greenland, at 83° 24′. 4. Could a pine box be partitioned off, and corners be painted so that it will answer for battery cells? A. Yes; it is often done. Coat with following mixture: 4 parts resin and 1 part gutta percha, with a little boiled oil and enough ground pumice to work well.

(2837) S. E. D. says: 1. Can I make a good stock toning solution, to tone black, one that will keep well, by following formula:

A

Chloride gold	15 grs.
Water	2 oz.

B

Bicarbonate of soda	115 grs.
Water	4 oz.

1 drachm A, 2 drachms B and 8 ounces of water. If not a good formula, please give me one that is. A. The formula is good, but for black tones the borax toning bath described on page 225 of the April 13, 1889, issue of the SCIENTIFIC AMERICAN is considered better. It should be mixed fresh shortly before using. 2. I would like a formula for a stock developer, one that can be used repeatedly, and that will give density. I want it more especially for instantaneous exposures which are rather under-exposed. I have been using an eikonogen developer similar to one of those mentioned in "Development of Dry Plates," by Mr. Burbank, but it gives very thin negatives, with such faint detail that they have to be printed in the shade. Is there no remedy? A. With any developer that may be devised it is impossible to produce an image if the light has had no effect on the sensitive film, as is the case when a plate is described as being rather under-exposed. Generally such exposures only develop on the surface, as the light has not had time to affect the underlying particles of silver. We advise the use of the eikonogen and potash developer. If this fails to produce an effect, no other developer is likely to. Make the eikonogen as follows:

No. 1.

Warm water	40 oz.
Sulphite sodium	2 "
Eikinogen	1 "

No. 2.

Water	3 oz.
Carbonate of potash	1 "

Take two ounces of No. 1, and add from one to two drachms of No. 2, or three drachms if necessary to bring out the details, allow from half to three-quarters of an hour's time for the development of one plate, should it be greatly under-exposed, and see that the temperature of the solutions is 70° Fah. Density is only obtained by a strong eikonogen solution and length of time of development. 3. What is the cause of the bubbles which form between the albumen and the paper in silver prints? How can I avoid them? And if they are not to be avoided, how can I cure them? A. Air bubbles in albumen prints are usually due to the difference in temperature of the different solutions; they should all be kept at 70° Fah. If the prints are put into a weak solution of salt and water prior to toning, their appearance may be prevented.

(2838) T. C. B. asks: Is it not a fact that statistics show that the Indians in the United States are increasing in numbers? That is, has not each reservation a larger population than twenty years ago? A. Indian statistics are not very reliable. The point you make has been advanced before. They are decreasing on the reservations. From 1889 to 1890 there was a decrease of over 1000 out of 133,382 reservation Indians.

(2839) A. B. asks how to make a paste for mounting photograph prints. I have tried starch paste by the formula given in books on photography, but in some cases the corners of prints come loose, so should like to have a formula that you could recommend, both as to quality for holding the print on card mount after reasonably rough usage, without corners becoming loose, and to contain no chemical that could in any manner cause the print to fade. I am using Bradfisch aristotype paper. Should the prints be wet or moistened?

A. Nelson's No. 1 photographic gelatine	4 oz.
Water	16 "

Dissolve the gelatine in warm water, then add:

Glycerine	10 oz.
Alcohol	5 "

Another mountant is as follows:

Arrowroot	150 grs.
Water	3½ oz.

Previous to adding the arrowroot dissolve in warmed water 15 grains of gelatine. After boiling them with the arrowroot added, let it cool and add 2½ drachms of alcohol and a few drops of carbolic acid. The prints should be slightly moistened prior to mounting. It is a good plan too to put them in a hand screw copying press for a minute after mounting, which insures even contact of all portions of the picture. 2. Please inform me of a method of producing a good *glace* finish on photographs. A. A *glace* appearance may be given to prints by rubbing over the surface lightly with clean flannel the encaustic paste made by dissolving in 200 grammes of benzole the following ingredients:

Gum elemi	10 grms.
Essence of lavender	300 "
Oil of spike	15 "

Filter and add

Pure virgin wax	500 "

The whole should be set on a water bath, which will aid in dissolving the wax. To make the paste thinner add more of the essence of lavender.

(2840) G. E. asks (1) how to prepare the white that is used by gilders on white and gold frames. A. Soak 4½ ounces fine glue in water, add water to 1⅛ pints, boil. Mix 8¾ ounces Spanish and 4½ ounces French chalk, triturate with the glue water, and apply by spattering. The mass should be of consistency of sirup. 2. How to make composition ornaments hold to polished shellac surfaces. A. Scrape off the shellac. 3. What is a laminated core? A. A core made of sheet metal in layers. 4. What is vulcanized fiber? A. In general some form of parchmentized paper. Parchmentizing is effected by immersing paper in a cold mixture of 2 volumes oil of vitriol and 1 volume water, washing in water and then with dilute ammonia. 5. How can shellac be dissolved without using alcohol? A. By borax solution, or after long standing by strong ammonia water.

(2841) O. M. says: 1. Will you kindly publish the names of the various photographic printing processes employed at the present time, stating their respective merits, also a brief description of their manipulation? By doing so you will greatly oblige an amateur photographer who is undecided as to the printing method he should adopt. A. We advise you to consult "The Amateur Photographer," by Ellerslie Wallace. Price $1. Also Wilson's "Quarter Century of Photography." Price $4. 2. Is the inhaling of vapors arising from the manufacture of oil varnishes deleterious to health? A. If the manufacture is carried on in a confined apartment, yes. 3. Are the lenses such as used in No. 4 Kodaks made from solid pieces of glass? A. We think they are. 4. In any case how many sections are there? A. Claimed to be achro-

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matic, two sections in front and rear. 5. Would not the employment of a thicker celluloid film for negatives prevent the same from stretching and losing its true flat surface? A. Yes, but it would be more costly. Carbutt's films are thicker than others.

(2842) M. B. asks: 1. Can you develop dry plates after night by a ruby light in a small room, just the same as in a closet or dark room in daylight? A. Yes. 2. After fixing the negative and rinsing in water, can the plates be exposed to the light while drying, or must they be left in the dark room until perfectly dry? A. Day light will not hurt them. 3. In producing a positive, can you print from the negative without the rays of the sun? If so, in what way? A. Yes; by using bromide paper and a kerosene light.

(2843) J. H. asks: 1. Could you give formula for a ferrotype varnish which would dry very glossy when applied to the finished tintype cold or warm? A. A varnish may be made as follows:

Alcohol (95 per cent strong)	50 parts.
White shellac	12 "

To which add a few drops of oil of lavender. 2. There is a certain varnish sold as celluloid varnish, which smells strongly of bananas; could you give approximative formula of it? Would this last celluloid varnish not answer the purpose for tintype varnish? A. We think it is largely composed of pyroxyline and a solvent. It can be used on ferrotypes without heat, and should give a good gloss. The varnish is made by the Frederick Crane Chemical Company, Short Hills, N. J. 3. Please give a description of how to make the simplest constructed developing rocking machine, that will rock for at least half an hour. A. Suspend a pendulum rod three feet long from a bench, with a heavy weight attached to the lower end. Arrange a flat plate at upper end, on which rest the developing dish. Pushing the pendulum once in a while will keep it in motion, or a clock movement can be attached to do it.

(2844) F. A. H. asks how to prepare views for the magic lantern. A. Use the Eastman or Carbutt lantern slide plates, to be had from dealers in photo. materials. Consult Ellerslie Wallace's book, "The Amateur Photographer," price $1.

(2845) J. W. F. asks: 1. How to dissolve crude or virgin rubber so it will be perfectly pliable and absorb all waste gold around a finisher's bench in a book bindery. A. You need what artists use under the name of burned rubber. Its manufacture is described in "Rubber Hand Stamps and the Manipulation of Rubber." $1 by mail. 2. How are the water marks made in silk? A. By hot calendering between engraved rollers.

(2846) C. R. M. says: I have a camera the bellows of which leaks light very badly. What application can I use which would afford an impervious coating, to repair the damage? A. Dissolve some shellac in alcohol, add lamp black till it is black, then apply with a brush until the holes are filled. If this does not answer, paste strips of thin rubber over damaged parts with rubber cement.

(2847) C. M. W. asks: Is the using of condensed steam in a boiler injurious to the boiler? Some claim that it eats the flues out more rapidly after having been condensed, that the acids from animal oil lubricants is the cause, and that mineral oil lubrication does not leave any injurious acid. Others claim it is some natural property of the condensed steam that causes the trouble, and not the fatty acids. Please state whether it is true that condensed steam reused in a boiler is injurious, and if so, please give fully the cause. A. The water from condensed steam does no harm to boilers. If the engine oil or tallow is carried in with the water, it is a damage to the boilers. It collects dirt and scale and forms an oil cake that may lodge on the shell over the fire or on the tubes and cause them to burn or bulge. The acids of fat lubricants are injurious to boiler tubes. If it is necessary to use the exhaust steam, it should be condensed and run into a separating tank, where the oil could be skimmed off.

(2848) M. E. M. writes I want to use an incandescent lamp of one candle power at night to see what time it is on my watch by pressing a button, lamp not to be lighted any more than a minute at a time. A. Use two cells of Leclanche battery. If used for no other purpose, the battery should work well for at least six months without attention.

(2849) T. D. W., Jr., asks: Can you give me any information or any book in which I can find how to place a photograph on a brick so as to use it as a paperweight? I have a brick from an old church that has been pulled down, and the lot sold. On this brick I wish to place a photograph so that it can be easily seen. Would it be possible to make it smooth enough to put a film on it, as in the wet plate process, and if so how could the brick be made smooth enough to do this? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 382. Get some stone cutter to polish the surface of the brick, then brush over it a silicate of soda solution; when dry brush over a solution of gelatine 5 grains dissolved in water 10 ounces. Then make a positive print of the picture on Eastman's transferrotype bromide paper, and squeegee it on to the brick. After removing the paper and drying, protect with a coating of diamond varnish.

(2850) W. H. writes: You sent me a recipe for a magnesium compound composed as follows:

Chlorate of potash	3 parts.
Perchlorate "	3 "
Magnesium powder	4 "

Now I have tried to obtain perchlorate of potash at all the largest chemical places in Boston, without success. One chemist said he could make me some, but it would immediately be converted into chlorate upon exposure to the air. A. It is made by projecting powdered chlorate of potash into warm nitric acid, and on standing, or if necessary after evaporation, the crystals separate, as it is not very soluble. It can be prepared by any competent chemist and will not decompose as stated in your query.

(2851) J. R. W. asks how a deposit of copper deposited from a bath of copper sulphate may be made to adhere permanently to a rod of soft iron. It will deposit rapidly, but is easily washed off. A. You can only produce adherence of a thin coating by simple immersion. To get a thick one you must use a battery and preferably a cyanide solution of copper. See our SUPPLEMENT, No. 310, for details, etc.

(2852) W. H. asks: Which is the poorer conductor of heat, glass, china, stone, or earthenware, and can they be modeled in any shape or form? A. We should think there would be little difference. Almost any shape can be given them.

(2853) R. M. L. asks in what numbers of SCIENTIFIC AMERICAN he can find good paste solutions for gummed paper, such as will not stain, stick too tight, or be poisonous. A. Gum arabic with enough oil of cloves to give a slight perfume is excellent. See SCIENTIFIC AMERICAN, vol. 53, No. 15. We have many times published postage mucilage in the queries. Tight sticking is considered desirable.

(2854) G. F. C. asks: 1. If I place a lighted lamp (oil or spirit) or a candle in a jar or vessel and immediately hermetically seal it, when the light is extinguished, what will the vessel contain? What will the pressure on the inside of the vessel be? Or what fraction of a vacuum will I obtain? A. The pressure will be slightly reduced on cooling, so as to produce a slight vacuum of perhaps one or two pounds to the square inch less than atmospheric pressure. 2. Can I ignite an oil or spirit lamp with a battery? If so, what number of cells will I require? A. You can by arranging a fine platinum wire across the wick, and heating it to white heat. Three or four bichromate cells should suffice. It is not a very practical method. 3. What material could I substitute for a lamp which would readily ignite and take up the oxygen? A. Phosphorus will absorb oxygen without igniting. Nitric oxide and water will do the same. A hydrogen flame will be effectual also. 4. Can a vacuum or partial vacuum be obtained by means of a battery? A. A rod or filament of carbon made incandescent will combine with the oxygen of the air and form carbonic acid gas. If a little caustic soda or lime is in the vessel, this will absorb the gas in question, and on cooling there will be a reduction of pressure of about 3 lb. to the square inch.

(2855) H. B. L. asks: What to put into silver polish paste mixed with water to keep it from drying up. A. Glycerine.

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February 10, 1891,

AND EACH BEARING THAT DATE.

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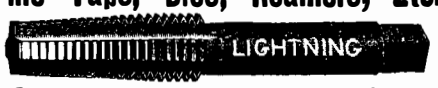

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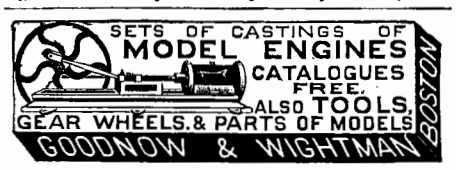

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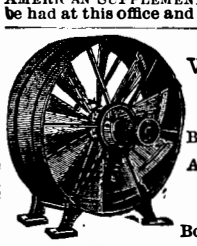

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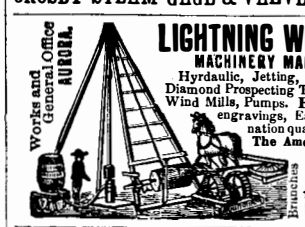

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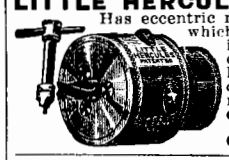

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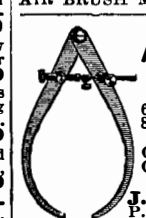

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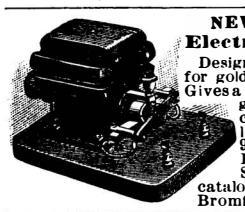

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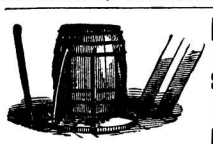

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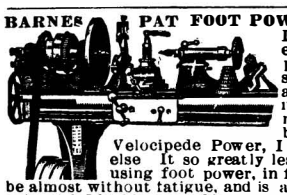

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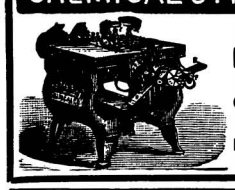

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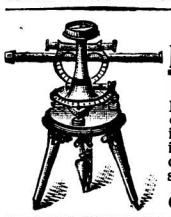

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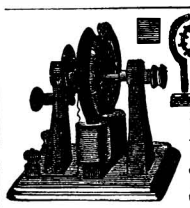

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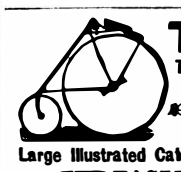

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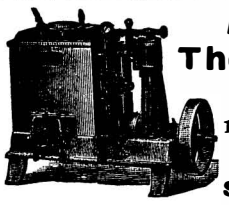

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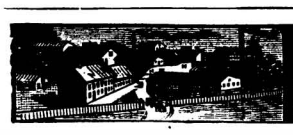

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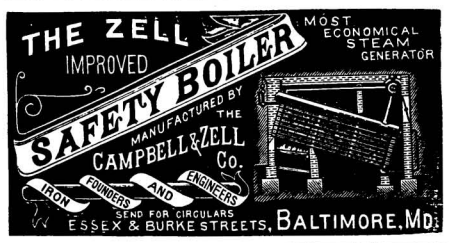

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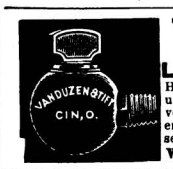

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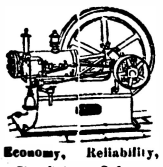
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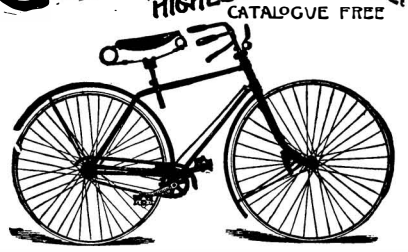
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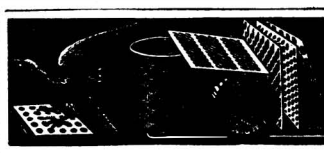
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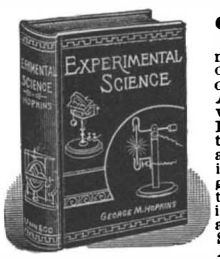

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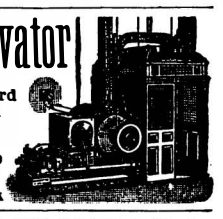

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